FEBRUARY 1960

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

UNIVERSITY MICROFILMS
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PIZ

How to improve buyer-vendor relations—see page 29

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

PMM

The magazine for design, finishing and the use of:

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PLASTER MOLD CASTINGS • SHELL MOLD CASTINGS
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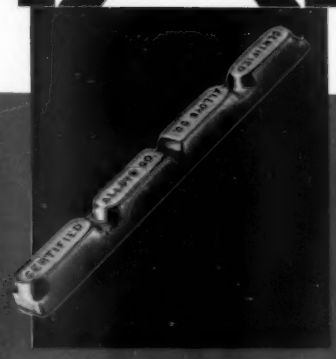

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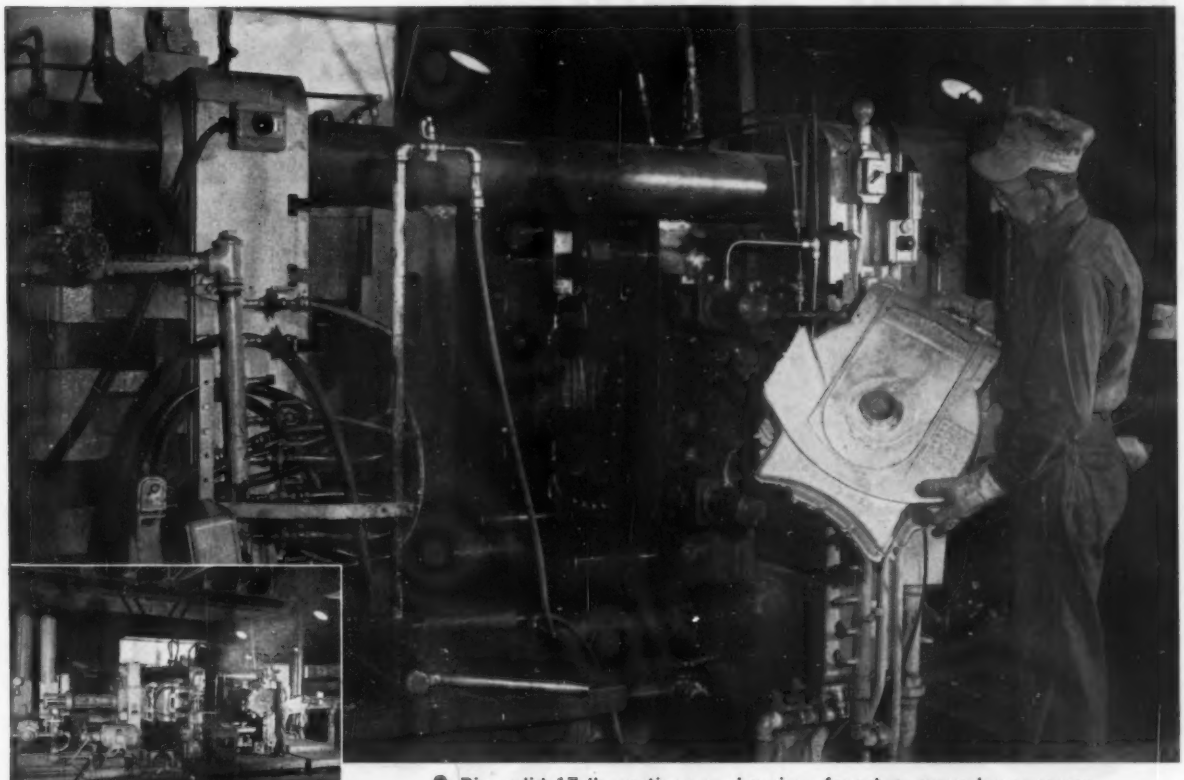

● Big, solid 17 lb. castings are housings for rotary power lawn mowers. Production averages 80 housings per hour. This is a 1000-ton Cast-Master Die Casting machine — one of two in this plant.

● All operating elements of this efficient 1000-ton Cast-Master are conveniently accessible for instant adjustment or inspection.

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G. L. Graft, Divisional Supt. for The Newark Ohio Company Newark, Ohio stated, "We like Cast-Master's die locking toggle mechanism and the rugged qualities of these machines. They've been doing a fine job for us on all sizes of castings up to 17 lbs. each. They're fast; scrap loss and flash are negligible." This company manufactures Kenmore Electric Ranges and Craftsman Rotary Power Lawn Mowers, exclusively for Sears, Roebuck and Company.

If you're moving into the die casting field involving new, larger castings, investigate the Cast-Master line of high production die casting machines — 100-ton to 2000-ton capacities—cold chamber or hot chamber models. Write for Bulletin CM-100.

H26

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PMM **IN THIS ISSUE** February, 1960: Volume 18 Number 2

FEATURE ARTICLES

29 BUYER-VENDOR RELATIONS

Many of the troubles which arise between the buyer and the vendor of die castings come from incomplete or vague specifications. Here a vendor suggests corrective means.

32 LOCKING ALUMINUM SECTIONS

Industrial gratings are widely used for walk ways and light trucking passages. The author describes a new, extruded grating which has many advantages over the older types.

34 MAJOR CAMERA PRODUCER CHOOSES DIE CASTINGS FOR PARTS

When industrial designers set out to redesign a complete line of cameras, slide projectors and movie projectors they turned to die castings for the best manufacturing method to get their ideas into practice.

37 METAL HANDLING — KEY TO EFFICIENT OPERATION

Dow Metal Products Co.'s new die casting plant has been laid out for the most efficient handling of both solid and molten metal.

38 HIGH QUALITY STRUCTURAL 17-4PH CASTINGS

In aircraft and missiles the use of castings has been limited to non-critical parts. Here, the author shows that investment castings can be used for critical parts.

42 HOW EXPENSIVE ARE FIRE RESISTANT FLUIDS?

Many companies who should use fire resistant fluids do not because of mistaken ideas about costs. According to the author, they need not cost more than petroleum oils to use.

46 DESIGN TIPS

This months design tips show some ways and give design information on the use of inserts in die and permanent mold castings.

70 18 TO 1 STOCK REDUCTION

Through the use of a sintered hub, an electric motor manufacturer reduced his raw material stock from 18 sizes to a finished product.

70 SPECIAL ALLOY, TIGHT TOLERANCES, STILL ECONOMICALLY PRODUCED

When a manufacturer of special equipment needed a tube assembly of special aluminum alloy in a tricky design, he turned to extrusion.

71 LITTLE CASTING DOES TOUGH JOB

Tiny investment castings will often do a job which can't be done any other way without very great machining expense.

71 A BETTER PRODUCT AT LOWER COST

Outdoor lighting fixtures require light weight, strength, stiffness, and corrosion resistance. Only permanent mold casting could do the job economically.

FINISHING SECTION

50 FINISHING MAGNESIUM CASTINGS

This is the first part of an article describing the different finishes which can be applied to magnesium castings.

DEPARTMENTS

8 Letters
14 New Products
22 Casting About
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75 Data in Ads

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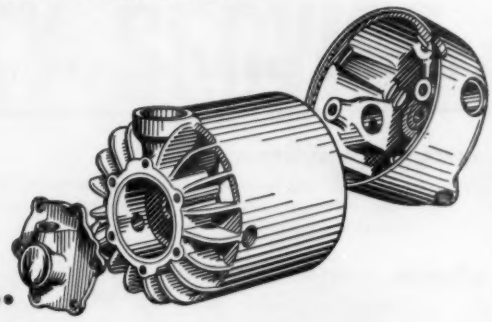
It takes "More Than a Machine" to Produce GOOD Die Castings...



and MILWAUKEE has what it takes!

Among other needed factors, it takes a staff of trained die casting engineers . . . skilled die designers . . . die builders . . . machine operators . . . plus an intimate knowledge of the die casting process, its limitations and possibilities. Most important, it takes the kind of *know how* acquired only through years of specialization in the design and production of die castings in many shapes and sizes for thousands of different applications.

A pioneer of the die casting industry, Milwaukee offers everything you need for the production of fine die castings . . . completely modern plant facilities . . . highly skilled technicians . . . and more than 50 years of continuous service to die casting users throughout industry.

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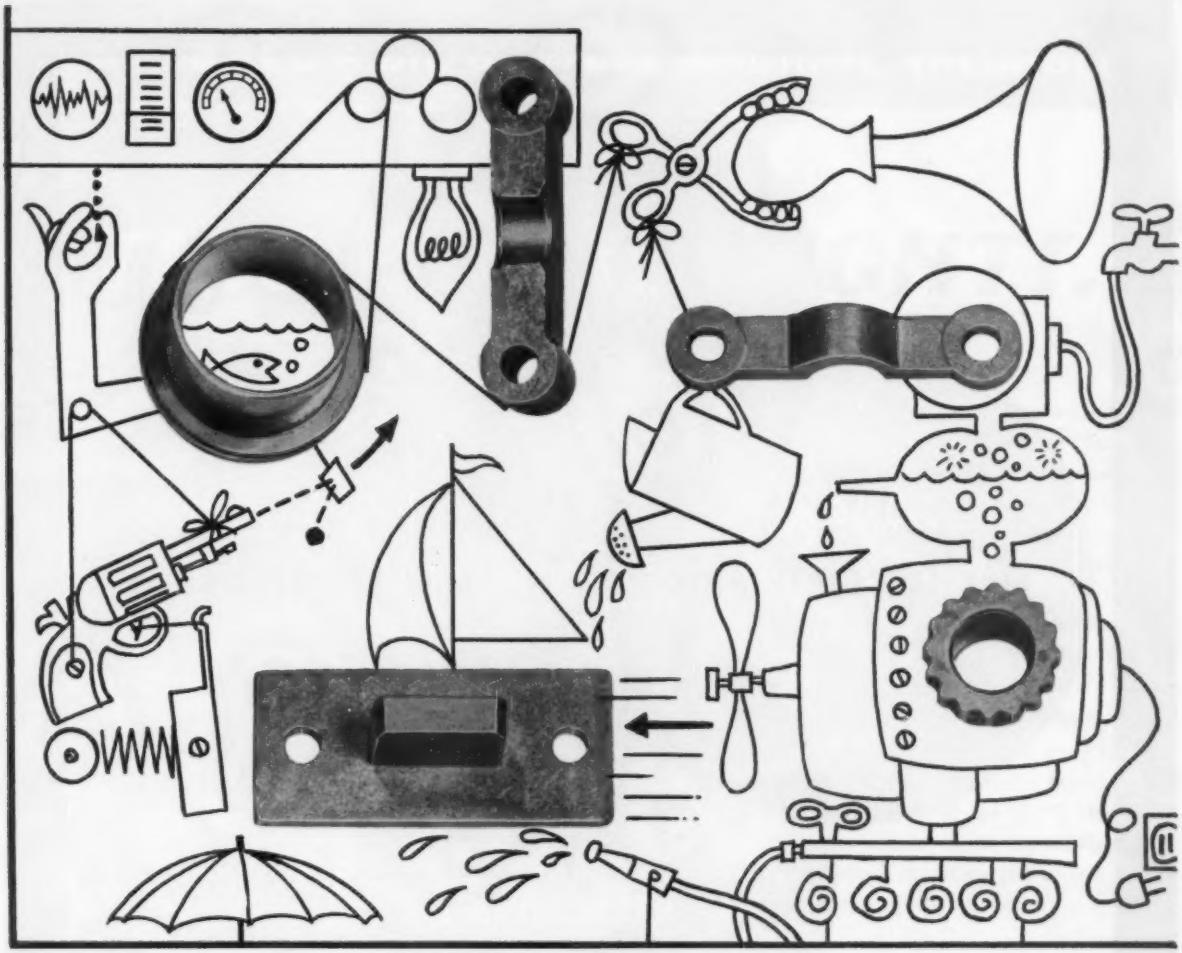

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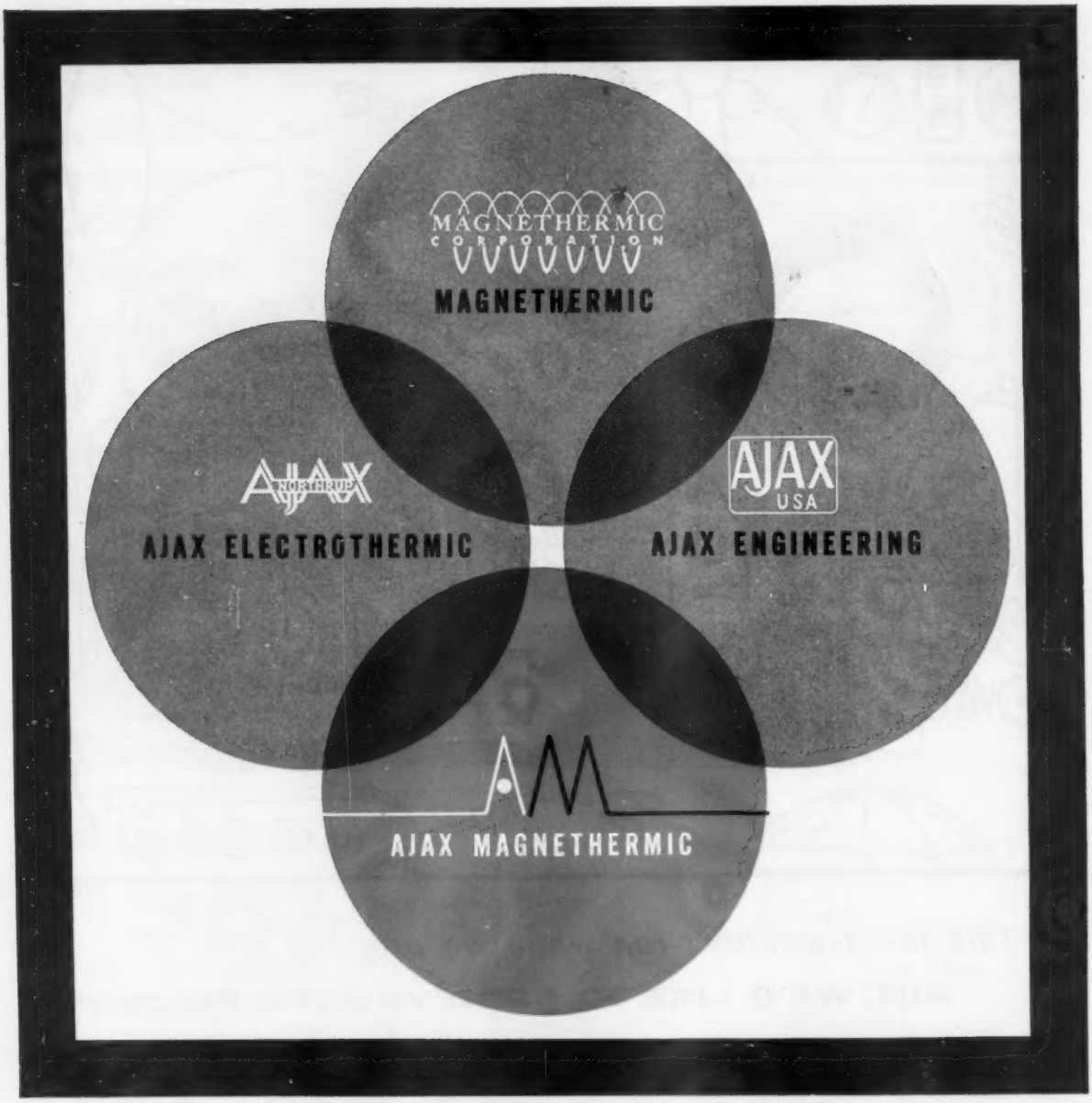

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PRECISION METAL MOLDING

WHAT MAKES A DIE CASTING MACHINE VALUABLE?

THIS BOY IS EIGHT!...

...and he's turning the adjusting screw on a Lester Die Casting Machine. That eight-year-old *strength and skill* is all that's needed to set the die height on a Lester—with no risk to alignment or accuracy. Contrast this with the scene in many die casting shops where a grown man must *sledge* the tie bar nuts to make a comparable adjustment.

What's the difference? Well, it all starts with the Lester cast steel frame, a marvel of rigidity, hand-scraped to an enduring alignment of .001". Mounted in this structure is an extra adjusting platen which is connected to the movable platen by a huge screw.

When the boy turns the crank... a worm turns the screw and the necessary die height is set as the movable platen inches in or out, floating on hardened steel gibs. With an "instrument" like this, any man in your shop can make micrometer-like adjustments as the dies heat up. It's literally child's-play.

What makes one die casting machine more valuable than another? Just such features that take the human element out of the process...features found only on a Lester.

Write today for full specifications on the complete line of Lester machines for either aluminum or zinc.

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PMM LETTERS

the readers' forum

CASTING LEAD

In the October issue of PMM under Letters to the Editor you have reprinted a portion of a letter referring to lead die casting. We would appreciate a copy of the list of die casters capable of handling lead and the list of manufacturers of small die casting machines you mention.—H. W. P.—Ind. Eng.

A copy of our directory listing contract die casting shops and giving the metals they can cast has been sent to this reader. For listing of manufacturers of die casting machines he has been referred to the advertising pages of PMM.—Ed.

LARGE CASTING

We would appreciate any information you have available as to sources for production of either complex die cast aluminum or investment casting sources for parts larger than the average for investment casting.—G. R., senior buyer.

Our directory issue listing die casting sources has been sent to this reader. We have also sent a list of companies we know of who are able to make larger than usual investment castings.—Ed.

INVESTMENT SHELL MOLDS

In your November, 1959 issue there was an article "Investment Casting in Shell Molds," by Paul E. Schlinkmann. We would like to obtain more information on the Nalcast materials. Will you forward this letter to the Nalco Chemical Co. for us.

We would like to know the fineness or screen analysis of the four Nalcast materials mentioned, the price of the materials, whether the use of the materials is covered by patents and if it is possible to obtain a working sample of either Nalcast P-1 or Nalcast P-2.—J. G. S., materials eng. dept.

In your November issue you ran an article "Investment Casting in Shell Molds" by P. E. Schlinkmann of Nalco Chemical Co.

I am unable to find the address of this company and wonder if you can contact Mr. Schlinkmann and ask someone from his company to get in touch with me.—W. D. Edsall, mgr. quality control.

Both of these letters have been forwarded to the Nalco Chemical Co, 6216 West 66th Place, Chicago 38, Ill.—Ed.

STEEL & MAGNESIUM CASTINGS

I would appreciate receiving your magazine on castings and all information on steel and magnesium castings for use in the aircraft and missile industry. Any information you can provide on properties of these materials will help us to accelerate the use of these castings. — A. B. — staff engineer, development.

As much information as we had was furnished. Unfortunately, most of the data this reader wants is in widely scattered publications. We have, however, referred him to a number of companies in his area who make both steel and magnesium aircraft and missile castings for such information as they have. — Ed.

To make it travel better and handle easier our TADANAC Brand Special High Grade Zinc slab has been redesigned. End notches hold steel strapping securely so that bundles arrive in good shape. Handholds permit safe, easy handling of individual slabs. The top quality of TADANAC Brand S.H.G.(99.99+%) Zinc is now marketed in this new slab designed to save the customer time and money.

Remember, Cominco's Technical Service stands ready at all times to assist you to get the best value from your use of TADANAC Brand Zinc.

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BRASS DIE CASTINGS

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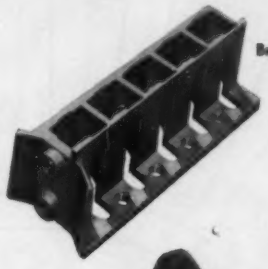
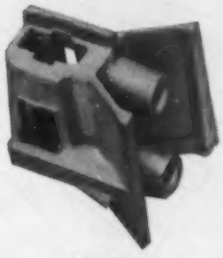

Brush Holder

Brush Holder

Tub Spout

Shower Head Body

Hose Coupling Sleeve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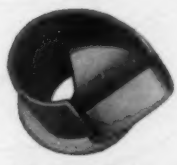
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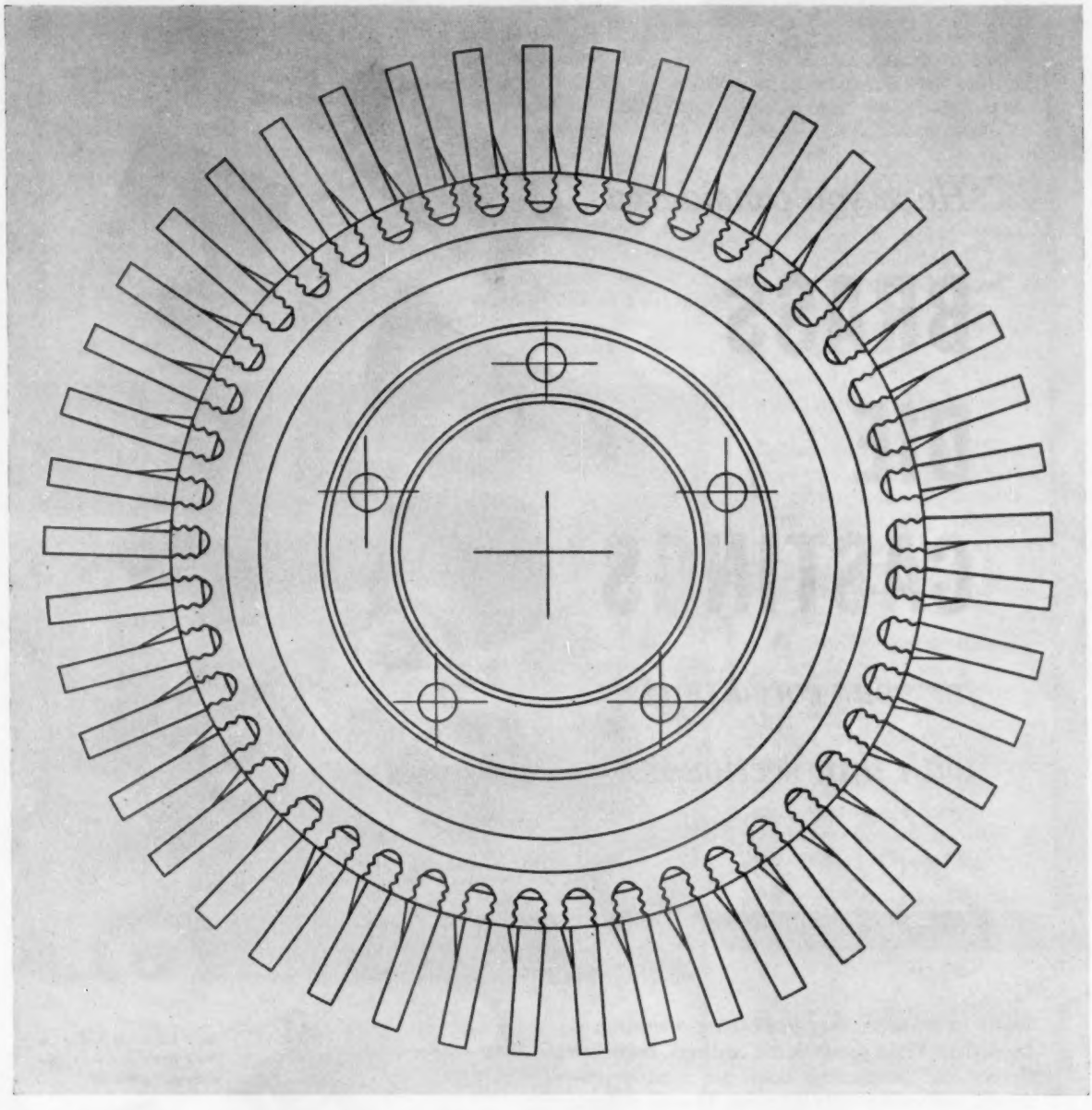

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Glascast gives you perfect reproducibility

Glascast is a unique material for making precision shell molds. A fine gray powder made from 99% silica glass, it has a very low coefficient of thermal expansion—less than 0.00000047 per °F. It is completely vitreous, does not undergo phase changes during firing or casting. These, and other characteristics, enable Glascast molds to give perfect reproducibility, casting after casting.

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This pump rotor with its seven "slippers" is employed in the automatic transmission of an automobile. Because of its complex design, it was a difficult and costly part to produce by conventional methods. American Sinteel engineers were able to solve the problems involved and now the part is being produced on a production basis at a low unit cost.

Low cost, high speed production, close tolerances and unusual design possibilities are among the many advantages of Sinteel powdered metal parts. There are literally thousands of applications, including such products as gears, cams, complex nuts and fasteners, special purpose filters and structural members from steel, iron, brass and copper alloys, where Sinteel powdered metal parts can improve the performance of products now being made by other, more expensive methods of manufacturing. Powdered metal parts are available with many special characteristics, including self-lubrication, controlled porosity for infiltration and good electrical and magnetic properties for pole pieces, armatures and cores. Whatever your product requirements are, American Sinteel Corporation can produce precision parts to your specifications at substantial savings.

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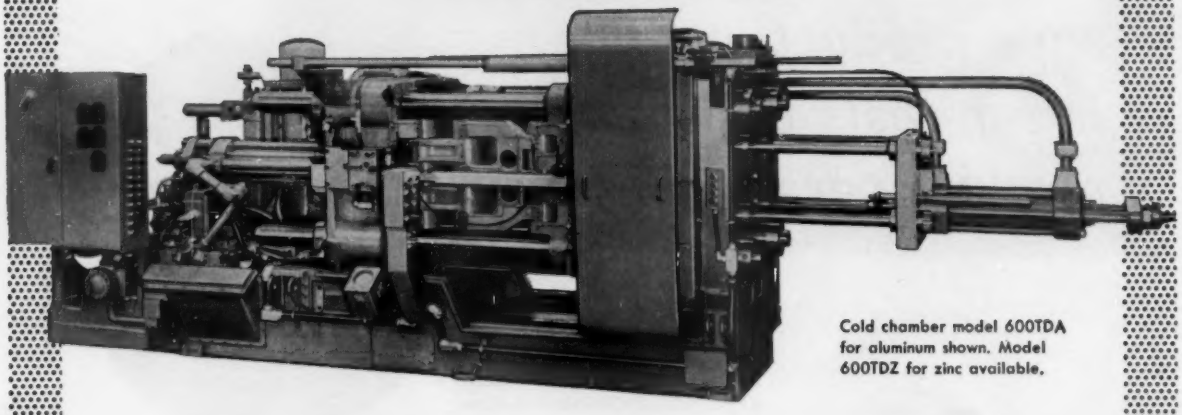
New 600-Ton REED Die Caster



Cold chamber model 600TDA for aluminum shown. Model 600TDZ for zinc available.

The all new REED 600 TD, designed for both cold and hot chamber die casting

Reed-Prentice has designed a new 600-ton die caster that will produce the highest quality magnesium, aluminum and zinc castings possible. Available for both cold chamber and hot chamber die casting, the 600-ton REED has 47″ x 46½″ die plates; 28½″ x 28½″ clearance between tie bars; a tie bar diameter of 5½″; and a strain gauge tested locking pressure of 600 tons. Other design and operating features for rugged, efficient, and dependable die casting include:

- Die Stroke adjustable over 6″ of initial stroke, providing an adjustable stroke of 12½″ to 18½″.
- Shot stroke cylinder is adjustable from 14″ to 20″ in order to accommodate different length sleeves.
- Tie bar adjustment is accomplished by use of one retained graduated tie bar nut.
- Tie bars may be pulled or moved forward by hydraulic power using a cam way lock device.
- Electric and hydraulic circuits provide for any type operation.

Ask your REED Sales Engineer today for all the facts about the Reed-Prentice 600 TD and the full line of REED die casting machines.

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division of

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These L.D.C. Aluminum Die Castings help keep a marine radar system on the beam

Indicator Unit of the new Sperry Radar 5. Control housing and indicator frame are L.D.C. corrosion-resistant aluminum alloy.

There's no guesswork with the new Sperry Radar 5, the navigating aid and anti-collision device for small boat operators. It enables the pilot to obtain relative bearings of other vessels and objects within range . . . allows the navigator to sight land falls . . . offers greater safety at night and during bad weather.

Reliability and diversity of the Sperry Radar 5 are made possible through modern design and precision engineering, sparked by complex and quality-proven parts . . . that include L.D.C. corrosion-resistant aluminum alloy die castings.

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Latrobe, Pennsylvania

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NEW PRODUCTS AND DEVELOPMENTS

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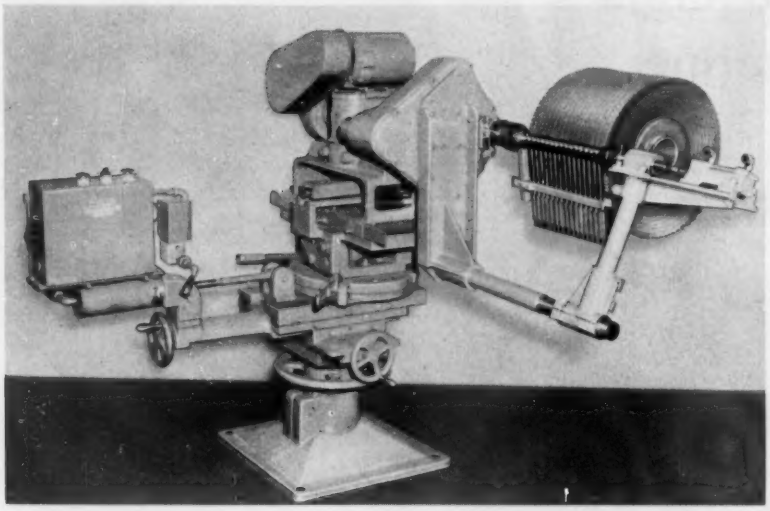


FINISHES PARTS WITH OBSTRUCTIONS

ACME MANUFACTURING CO. — Die castings and other parts with radius portions that require buffing can be automatically buffed or polished by the Acme E-10 semi-automatic machine. The unit is equipped with an air cylinder advance and an oscillating arm fixture.

The oscillating arm unit can be adjusted to give from zero to 360-degrees of oscillation. Parts can be mounted on an arbor with a locator and square drive. Then the arbor and part assembly are positioned in the oscillating-arm unit by an air-powered tailstock.

Circle No. 235 on Reader Service Card

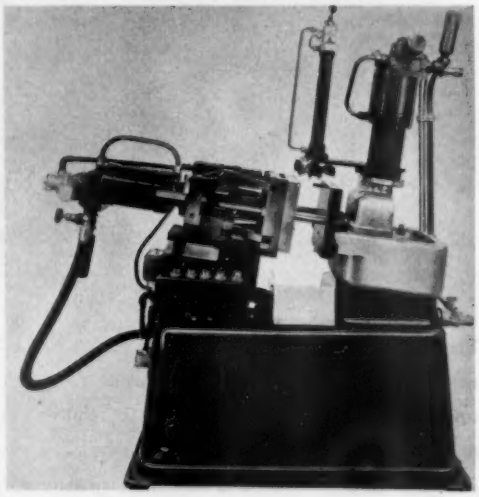
FEATURES AUTOMATIC CYCLING, 4-WAY ADJUSTABLE DIE UNIT

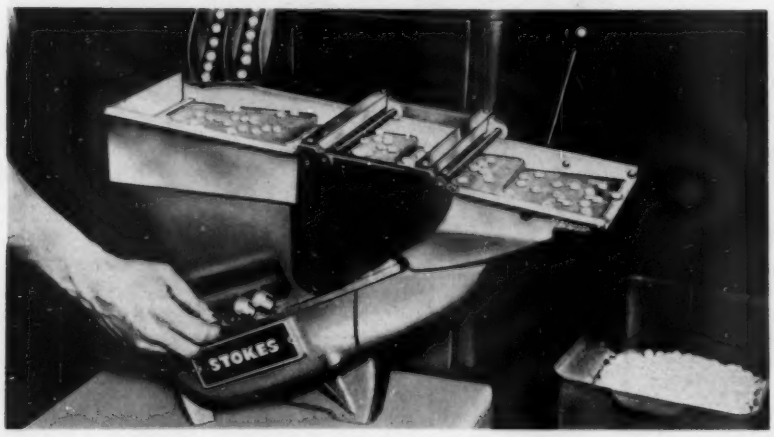
DCMT SALES CORP. — The DCMT Mac 99 automatic cycling die casting machine is a successor to the DCMT Imp 96. This new 15-ton, 1 lb. capacity machine features push button controls, and a quick-attach electronic timer unit for single-cycle automatic operation.

Other features include a four way adjustable die unit and spacer plate. This can be adjusted with the tie bars vertically or horizontally. The spacer plate is removed for center gating.

The machine incorporates a completely new solenoid-operated valve system, with two-way speed control for die setting and shockless operation. Exhaust mufflers are standard equipment. Safety features include dual micro-switches, replacing the die overlock safety, and a sensing device that retracts the toggles if foreign matter gets between the die faces.

Circle No. 236 on Reader Service Card





WILL REMOVE EXCESS POWDER

F. J. STOKES CORP. — Designed as a tablet duster, this new unit may have application for removing excess powder from powder metal compacts. The unit makes use of a static-eliminating device, in combination with a light air-stream and vibration. The static-eliminators produce a high-voltage discharge which ionizes the air, neutralizing the static charge on the dust particles.

Circle No. 237 on Reader Service Card

continued on page 18

You get
speedier service
from the
ZINC ZONE

Central location of
American Zinc plants assures
prompt deliveries of slab zinc to
any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

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ALL GRADES OF SLAB ZINC
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ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

American Zinc sales Company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY

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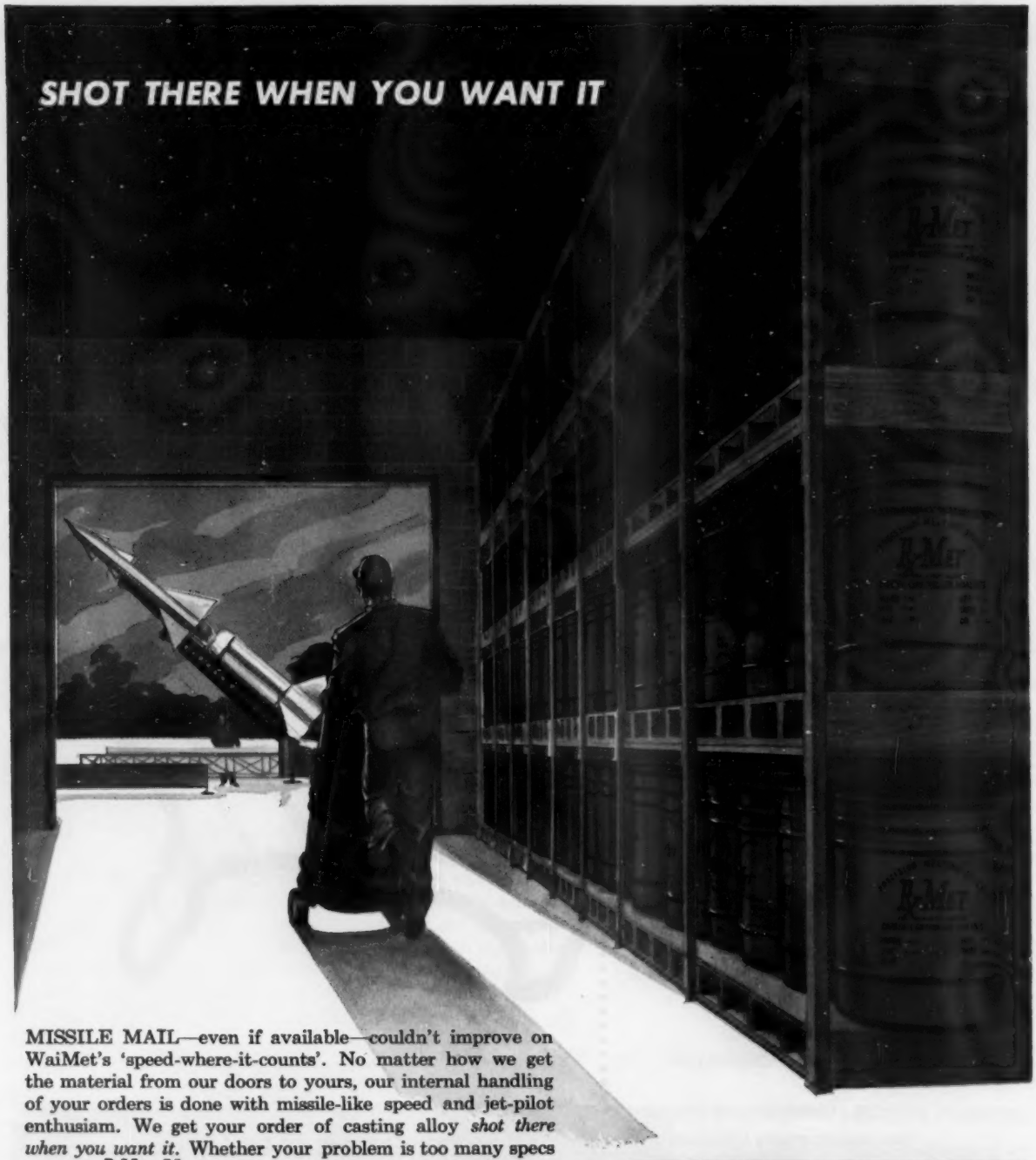
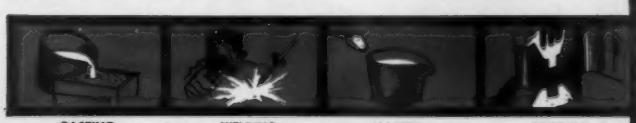
Circle No. 9 on Reader Service Card

SHOT THERE WHEN YOU WANT IT



MISSILE MAIL—even if available—couldn't improve on WaiMet's 'speed-where-it-counts'. No matter how we get the material from our doors to yours, our internal handling of your orders is done with missile-like speed and jet-pilot enthusiam. We get your order of casting alloy *shot there when you want it.* Whether your problem is too many specs (try our RxMET-U alloys) or better properties in tough alloys (read our reports on 17-4PH and WI-52) or just regular on-time shipments of castings alloys, call on WaiMet, leaders in special alloys.

AND NOW, we're doing new and interesting things in special alloy forging billets and master alloys.



CASTING ALLOYS | WELDING ROD | MASTER ALLOYS | FORGING BILLETS

WAIMET ALLOYS CO.

5320 OAKMAN BLVD.
DEARBORN 2, MICH.
LUzon 1-7200

TOOL STEELS • STAINLESS STEELS
SUPERALLOYS • VACUUM-MELTED ALLOYS

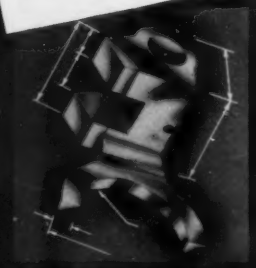
Circle No. 66 on Reader Service Card

BUNTING® BEARINGS

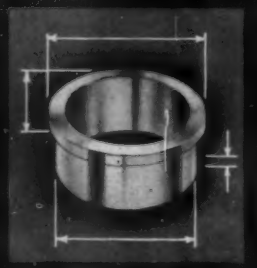
engineering for **both** cost and mechanical requirements in the bearing field . . .

Bunting can help you identify and procure the bearing or part that will do your job at the lowest possible cost. Often a re-examination of the actual mechanical needs of a bearing application reveals an opportunity to save money in design. Another saving is almost invariably achieved by considering ALL the new bearing materials which Bunting makes available to you today. Let Bunting help you engineer your bearing application in the light of modern availabilities. Send in your blueprints or ask for engineering counsel.

...case in point*



*Clearly evident is the economy in the production of this shifter fork by Bunting Powder Metallurgy. The elimination of machine work effects striking cost reduction.



*This cylinder gland bearing made of Bunting Bearing Aluminum is an example of how to save weight and money on the cost of large, thick-wall bearings and parts.

*This cast bronze cam block, made to unusually close limits with very fine finish, is absolutely round and true to size with cost at a feasible figure.

*Solid cast aluminum gear bearing to replace roller bearing for longer life and lower cost.

BUNTING ENGINEERS . . . **Bunting maintains a staff of bearing engineers whose wide experience and specialized knowledge are available to you gratis for study and recommendation concerning your current or contemplated bearing applications.**

Write for these:

NO. 158 • GENERAL CATALOG—Complete listings of Cast Bronze and Sintered Bronze Stock Bearings and Bars and Bunting Bearing Aluminum Bars. Pocket size edition.

NO. 1 • • • ENGINEERING HANDBOOK OF POWDER METALLURGY—A comprehensive technical treatment of engineering and manufacturing of sintered metals, bearings and parts.

NO. 46 • TECHNOLOGY OF BUNTING BEARING ALUMINUM — A technical treatise on the composition of and machining Bunting Bearing Aluminum Bar Stock.

The* BUNTING *Brass and Bronze Company • Toledo 1, Ohio • Phone EVergreen 2-3451

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

Circle No. 14 on Reader Service Card

continued from page 14

WAX CAPACITY INCREASED

LEYDEN HYDRAULICS, INC. — The wax capacity of the company's Model FSIWP Wax Injector has been increased from 1¾ to 3½ pounds. This new capacity will be standard on the machine. It is said to give the customer greater flexibility for the increasing size of patterns.

Circle No. 238 on Reader Service Card

ULTRASONIC GENERATOR

INDUSTRIAL ULTRASONICS CORP. — A ultrasonic generator has been developed that features simple operation, requiring no tuning or monitoring. The generator makes use of feedback to measure the actual amount of ultrasonic activity in the cleaning tank and vary the output frequency of the generator accordingly. The frequency is adjusted automatically until maximum cavitation is obtained.

Circle No. 239 on Reader Service Card

FOR COMPLETE DIE CASTING SERVICE

After 30 years of serving the die casting industry we have expanded to offer you complete die casting service.

DESIGN —
Our staff of experienced die casting engineers stay with the job from initial design to finished casting.

DIE CASTING —
Complete facilities to produce castings weighing 14 lbs. zinc.

PLATING —
Plating of all sizes, weights, and types available, from barrel zinc to the most difficult, automobile bumpers.

LABORATORY & INSPECTION FACILITIES —
Our laboratory and inspection facilities is your assurance of quality castings.

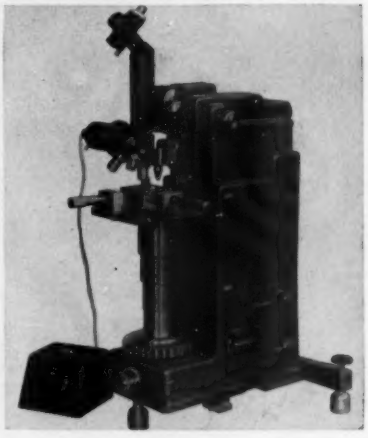
DiSalle

The DiSalle Plating & Die Casting Co., Inc.

2851 South Ave.
Toledo 9, Ohio

Circle No. 24 on Reader Service Card

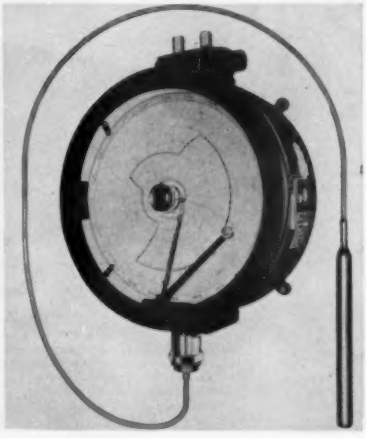
HARDNESS TESTER



TORSION BALANCE CO. — The Kentrol Micro Hardness Tester, with a vertical capacity of 8", will apply dead weight loads from 1 to 1000 grams. Designed to test unmounted parts, the unit can be furnished with additional weights for applying heavier loads up to 10,000 grams. Mounted specimens, small parts, sheet metal, etc., can also be tested.

Circle No. 240 on Reader Service Card

PNEUMATIC TEMPERATURE CONTROL



PARTLOW CORP.—A new recording pneumatic temperature program control has been introduced for installations using steam heating. The unit, Model RCA, program controls heating appliances and also features accurate and sensitive proportioning valve operation, plus recording. It is available in any of ten temperature ranges between —30° and 1100° F.

Circle No. 241 on Reader Service Card

continued on page 20

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*

Careful addition of sulfur to melt guarantees typical sulfide distribution, as shown in photomicrograph of longitudinal specimen of EZ MACHINING tool steel.

Sulfur addition to melt held to narrow range in Allegheny Ludlum's EZ MACHINING GRADES

Uniform, finely-distributed sulfides mean uniform machining, uniform high finish, uniform long tool life order after order

Adding sulfur, actually an impurity, to a tool steel melt to make it free-machining must be done with care and precision. That's why Allegheny Ludlum maintains an extremely close average range in adding sulfur to its EZ MACHINING grades. But mere range, however narrow, is not enough. A-L has developed special techniques in adding sulfur and nucleating agents to produce the uniform, finely-distributed sulfides that characterize good free-machining tool steels.

A-L's extra care means you can standardize your machining operations from piece to piece and order to order. This reproducibility is reflected in uniform *machining;* uniform *high finish;* uniform *long tool life.*

For example, in the production of hobs these machining properties in Allegheny Ludlum's EZ MACHINING steels minimize the costly "backing off" operation for back clearance of multiple teeth, eliminating complicated extra heat treatment. Lower residual stresses are set up, because the steel has a lower resistance to the cutting action. Naturally, hobbing is only one of the situations where these free-machining characteristics can benefit you.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier. ***ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Building, Pittsburgh 22, Pa. Address Dept. PM-26***

WSW-7288

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country... Check the yellow pages

every grade of tool steel... every help in using it

Circle No. 6 on Reader Service Card

"the HITCHINER way..."

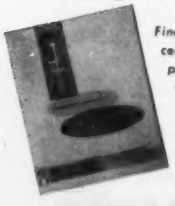
...and non-machinable super alloys in INVESTMENT CASTING

These spray nozzles for highway striping paint sprayers were formerly machined out of cold rolled bar stock. When ordinary paint was used, these nozzles functioned satisfactorily. However, when ground glass was added to the paint for reflecting purposes excessive wear caused frequent replacement.

By "the HITCHINER way . . .", we were able to engineer the manufacture of this part by investment casting in a non-machinable type alloy exhibiting a very high degree of resistance to both wear and corrosion.

This change of alloy, which eliminated the need for frequent nozzle replacement, was made possible through investment casting because the required close dimensional tolerances and detail could be cast to size.

Through the wide freedom of choice in alloy, as well as through flexibility in design and the elimination of expensive machining operations, investment casting may possibly solve your metal parts manufacturing problems. Send us your sample or blueprint and find out with a Hitchiner "engineered quotation" — no obligation.



Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure on the latest investment casting methods.

HITCHINER
MANUFACTURING COMPANY INC.
MILFORD 32, NEW HAMPSHIRE

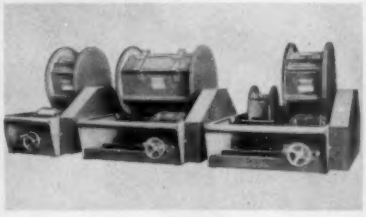
Coast to Coast Engineering Representatives

Circle No. 74 on Reader Service Card

NEW PRODUCTS

continued from page 18

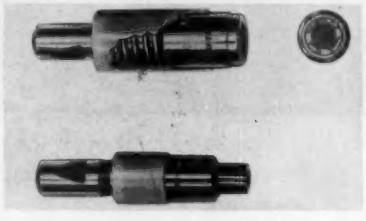
TUMBLE FINISHERS



RAMPE MFG. CO. — Rollabrader Models RA and RA2 feature three interchangeable barrel sizes of 2 quarts, 0.5 and 1.1 cu. ft. capacity. Barrels are easily removed from the machine by lifting handles. Features of the unit include: Variable speed drive of 20 to 46 rpm.; dual drive shafts; drive rollers in direct contact with barrel flanges.

Circle No. 242 on Reader Service Card

STOCK SIZE STAKING TOOLS



JAY-TEE SCREW MACHINE PRODUCTS — The development of a standardized line of production designed staking tools has been announced. Jay-Tee staking tools are available in eleven stock sizes from 3/16" to 1/2" diameter in 1/32" increments. The tools can be used in conjunction with indexing fixtures, on all types of air, hydraulic, kick, arbor and impact presses for staking of ferrous and non ferrous metals.

Circle No. 243 on Reader Service Card

BRIGHT COPPER PLATING

HANSON-VAN WINKLE-MUNNING CO. — Copper-Lume is a new bright copper cyanide process that offers these characteristics: Smooth, bright deposits over a wide temperature and current density range; good metal distribution; solution easy to operate and control; deposits can be buffed.

Circle No. 244 on Reader Service Card

THE PIERCE-WALLER

AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

WRITE FOR *FREE* FOLDER

PIERCE-WALLER, INC.
P.O. Box 2121A • DAYTON 29, OHIO

Plant: RAJAK MFG. CO.
Specialists in polyester impregnation of metals
245 N. Fourth St. • Tipp City, Ohio

Circle No. 40 on Reader Service Card

Picco Industries powdered metal parts build better barbeques

and it's

HOEGANAES ANCOR 80

for trouble-free production

Good tool life - - powder uniformity - - and no failures in the field. These are the three outstanding production benefits claimed by Picco Industries for these parts - - - thanks to the fact that they specify Hoeganaes Ancor 80.

Your nearby Hoeganaes Service Engineer offers you the same kind of trouble-free production when you specify from a wide range of Hoeganaes Sponge Iron Powders. Why not ask for his services . . . now.

Or, write direct for technical literature on your *particular* production problem.

HSIC

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

Circle No. 28 on Reader Service Card

CASTING ABOUT

technical news of applications & process involving precision metal molding

BUYERS WHO HAVE AN AVERSION to foreign made products will have to watch their steps if the steak platter shown here is any sample. It's a die cast aluminum sizzling platter that is made in Japan. If your eyes are good enough you can make out on the original label the words "Made In Japan" which have been obliterated, deliberately we are told. Several photo-engravers who looked at the paper label came up with the same answer; "deliberate damage to the printing plate."

While the words Made in Japan probably wouldn't stop many people from buying an article, in fairness to the producers in this country imported articles should be required to bear the name of the country of origin in some non-eradicable manner. In this case either cast in or stamped in on the casting.

USES OF ALUMINUM in automobiles continues to grow, year after year. The ten year trend in aluminum usage shows an annual increase of from 10% to 15% according to the Kaiser Aluminum & Chemical Corp.

FORECAST AVERAGE POUNDS PER CAR
1959 vs. 1960

CAR MAKE	POUNDS PER CAR AVERAGE 1959 (Actual)	1960 (Estimated)
Rambler	44.9	50.5
American	17.3	18.1
Ambassador	69.0	75 3
American Motors Corporation	41 6	46 3
Plymouth	51.4	67 5
Dodge	66.9	79 9
De Soto	78.7	78.9
Chrysler	91.3	75.9
Imperial	104.1	92.0
Valiant	—	52.6
Chrysler Corporation	61.9	69.9
Ford	55.2	59 0
Mercury	50.9	50.5
Edsel	52.9	50.9
Lincoln	83.5	77.3
Thunderbird	57.2	61.0
Falcon	—	49.6
Ford Motor Company	55.3	57.4
Chevrolet	36.6	42.2
Pontiac	46.3	47.7
Oldsmobile	53 7	43.2
Buick	65 3	69.1
Cadillac	71 8	56.6
Corvair	—	102.6
General Motors Corporation	45.4	52.7
Lark (Studebaker-Packard Corp.)	17.8	17.7
All Makes	49 6	56.2

For 1960 the predicted gain is 13%. As little as ten years ago the average per car was 12 to 13 pounds of aluminum. By 1955 this had increased to about 25 lbs. per car and for 1960 the average will be about 56 lbs.

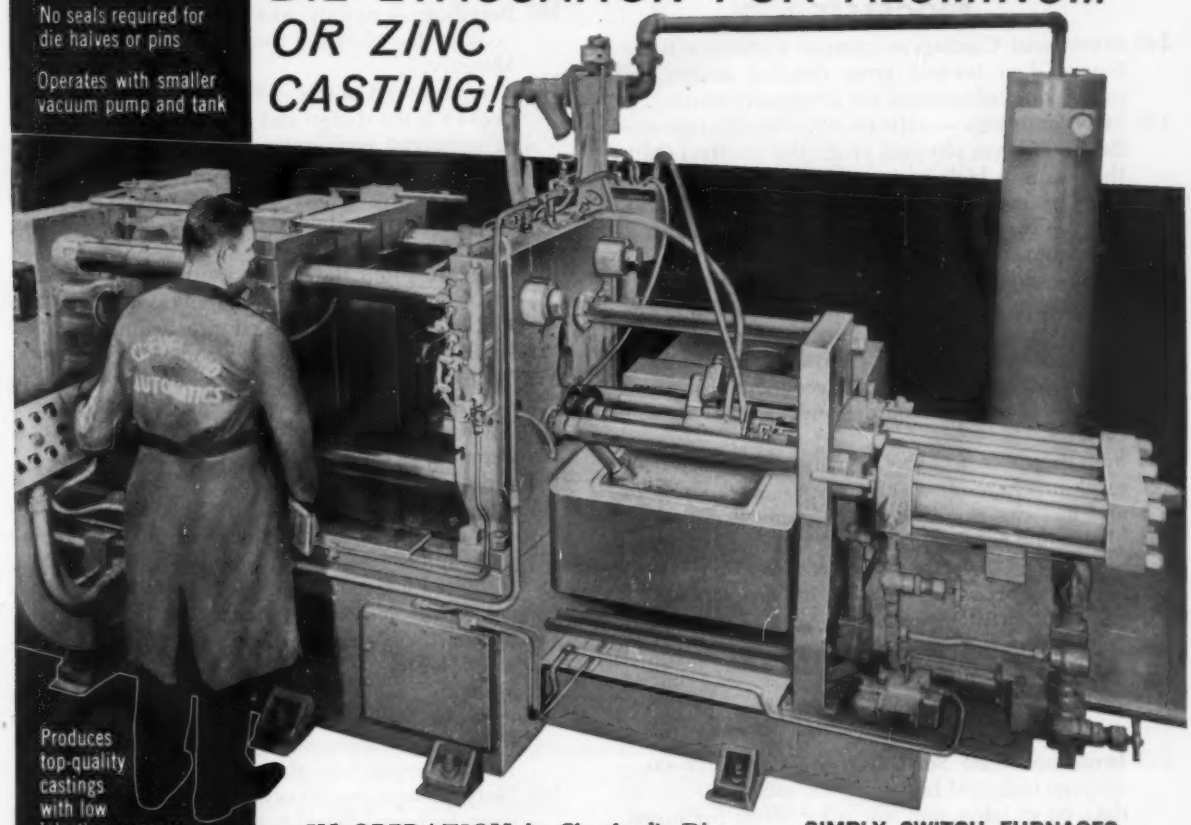
The most significant gains in 1960 are the Pontiac wheel and the Corvair engine, according to Kaiser. They further predict even greater gains in 1961 with such aluminum parts as bumpers, mufflers and radiators available. The following table is a comparative summary of aluminum usage by car line. All figures are net finished weights and do not include scrap generated in manufacturing.

A further break down, not shown in the table showed an average increase in aluminum trim from 9.0 pounds in 1959 to 9.8 pounds in 1960. At the same time, the aluminum used in functional components jumped from 40.6 pounds to 46.4 pounds.

WITH THE MORTON SYSTEM...

CLEVELAND TAKES THE LEAD IN VACUUM LADLING AND DIE EVACUATION FOR ALUMINUM OR ZINC CASTING!

- Lowest cost of any vacuum system
- Proven in production
- No shrouds or hoods to confine die area
- No seals required for die halves or pins
- Operates with smaller vacuum pump and tank



- Produces top-quality castings with low injection pressures
- Provides fast operation with less operator attention
- Machine maintenance reduced to minimum
- Less flash—cleaner dies—fewer rejects
- Automatic die and machine lubrication including plunger tip
- Template-programmed operation sequences
- The ultimate in machine operation flexibility

IN OPERATION in Cleveland's Die Casting Development Center is the 400-ton Cleveland 400-N Machine shown above. This Cleveland incorporates the lowest cost, most efficient vacuum ladling and die evacuation system in existence today!

For months, this machine has been producing an extremely thin-walled aluminum casting, having near-zero porosity and superb surface finish, at rates exceeding 300 shots per hour.

The casting is produced with a 4" dia. shot cylinder from a 1000 lb. charge in the accumulator, and by automatically ladling the aluminum and evacuating the die and shot cylinder from the vacuum system, which operates under a vacuum of 29.6 inches of mercury. No shrouds or die seals, etc., are used. (If desired, a 2000 lb. shot pressure, or an intensifier to provide 5000 lbs., can be supplied.)

SIMPLY SWITCH FURNACES TO CHANGE FROM ALUMINUM TO ZINC PRODUCTION

Note the unique furnace arrangement shown. This is a 30KW induction melting furnace on wheels, riding on rails. The entire furnace can be rolled out from under the shot end. By mounting another die, rolling in a second furnace charged with a different alloy or metal, and re-programming the machine controls, this Cleveland is quickly back into production!

A few of the many advantages of Cleveland Vacuum Die Casting Machines are itemized at the left. To convince yourself of Cleveland's superiority in vacuum die casting, schedule your visit to see this machine in operation, or call in a Cleveland field engineer.

Sales Offices: Chicago • Cleveland • Detroit • Hartford • Springfield, N. J.

CLEVELAND AUTOMATIC MACHINE COMPANY
4952 Beech Street • Cincinnati 12, Ohio

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Circle No. 18 on Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications free by circling the numbers on the Reader Service Cards facing page 76

PROCESSES

145 **Investment Castings** — CASTING ENGINEERS INC. — 8-page data booklet gives detailed design and purchasing information for investment casting.

146 **Steel Sinterings** — AMPLEX DIV., CHRYSLER CORP. — Brochure gives physical properties on Steel Oilite that features high impact strength.

147 **Die Castings** — GRIES REPRODUCER CORP. — Catalog lists die cast gear and pinion combinations available from stock dies.

148 **Sinterings** — NEW JERSEY ZINC CO. — 4-pages of design data on brass and other nonferrous sintering. Includes features and applications.

149 **Die Castings** — PRESSCO CASTING & MFG. CORP. — Technical literature on the economic factors in the use of copper base die and permanent mold castings.

150 **Sinterings** — DIXON SINTALOY, INC. — 12-page technical brochure gives advantages of the process and includes principles of economical design.

151 **Shell Mold Castings** — AMERICAN STEEL FOUNDRIES — Data on Amer-Shell steel castings that feature micro-dimensional tolerances, less machining.

152 **Impact Extrusions** — IMPACT METAL PRODUCTS CORP. — 4-page technical brochure explains the three types of impact extrusions.

MATERIALS & EQUIPMENT

153 **Investment-Cast Steels** — HAYNES STELLITE CO. — 40-page technical bulletin gives specifications and data on stainless and low alloy steels for investment casting.

154 **Melting & Casting Furnace** — KINNEY MFG. DIV., THE NEW YORK AIR BRAKE CO. — Metallurgy Bulletin 4510 describes a 50 lb. melting and casting furnace for casting billets or formed parts in either a vacuum or inert gas atmosphere.

155 **Powder Metal Presses** — HALLER, INC. — Data sheet on Model 2000-A, a completely automatic mechanical press. Gives specifications.

156 **Die Casting Machine** — FISHER GAUGE WORKS LTD. — Data sheet on the Fisher Model 24 Semi-Automatic assembly die casting machine, developed for high speed assembly of small parts.

157 **Marking Machines** — ACROMARK CO. — Data sheet illustrates marking and numbering machines for metals, castings, etc.

158 **Solid Film Lubrication** — POLY CHEM — Technical data on Poxylube, a solid film lubricant that provides permanent lubrication for rotating and sliding bearing surfaces.

159 **Vacuum Impregnation** — WESTERN SEALANT CO. — 6-page data folder on vacuum impregnation with PE‡1 for guaranteed 100% pressure tight castings.

160 **Dispersions** — ACHESON COLLOIDS CO. — Vol. 4 No. 3 of the Acheson Dag Disperser tells how colloidal and semi-colloidal dispersions cut production costs.

161 **Beryllium** — BRUSH BERYLLIUM CO. — 20-page booklet describes the use of beryllium in Project Mercury.

162 **Temperature Control** — PARTLOW CORP. — 23-page booklet is the design and process engineer's guide to industrial temperature measurement, control.

163 **Shell Core Machines** — DEPENDABLE SHELL CORE MACHINES INC. — Catalog gives specifications on machines for producing shell cores in all types of foundries.

164 **Standard Mold Bases** — DETROIT MOLD ENGINEERING CO. — Vol. 17 No. 8 of the DME News describes three new standard size mold bases.

165 **High Vacuum Pumps** — CONSOLIDATED VACUUM CORP. — 16-page technical booklet tells how to put vacuum to work, apply the Roots Principle. Gives operation, features and application of Roots Pumping Systems.

166 **Induction Heating** — LEPEL HIGH FREQUENCY LABORATORIES, INC. — Vol. 1 No. 6 of the High Frequency Heating Review tells of the floating zone method for growing germanium or silicon crystals.

167 **Insulated Thermocouples** — CONAX CORP. — Catalog lists over 24,000 assembly combinations for Conax Con-O-Clad Mineral Insulated Thermocouples.

168 **Vacuum Leak Detectors** — GENERAL ELECTRIC CO. — 4-page folder gives data on halogen-sensitive vacuum leak detectors. Can locate leaks down to 1×10^{-6} cc per second.

169 **Molybdenum** — CLIMAX MOLYBDENUM CO. — 12-page technical booklet gives data and selected references on binary and more complex diagrams pertaining to molybdenum.

170 **Tool Steel** — BETHLEHEM STEEL CORP. — Metallurgical data report on Cromo-W55 tool steel for extrusion dies, etc.

FINISHING

176 **Electrostatic Painting** — H. G. FISCHER & CO. — Data sheet on the Fischer "Super-Charged" electrostatic hand spray gun. Lists advantages.

177 **Surface Conditioning** — PERFECTO-PEEN, DIV. AEROTEST EQUIPMENT CO., INC. — 9-page technical bulletin on the Perfecto-Peen process for surface conditioning metals. Micronic glass spheres are impinged upon the surface being treated by a fluid stream to mechanically peen the surface.

178 **Ultrasonic Cleaning** — DETREX CHEMICAL INDUSTRIES, INC. — Data sheet on Sonicleaning. It combines solvent vapor degreasing with agitation by ultrasonic waves.

179 **Electrical Discharge Machining** — ELOX CORP. OF MICHIGAN — Technical data on electrical discharge machining of cavities, extrusion dies, powdered metal dies.

continued on page 58

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Experience and leadership in the manufacture of aircraft components have established Misco as one of the largest producers of investment castings. With the development of Misco's MONO-SHELL Process, which permits the production of many high quality components once avoided by conventional investment casting systems, the total industrial market can be served at competitive prices. *Send your inquiries, details of your requirements, or parts for quotation, to our Industrial Division.*

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Name_____ **Title**_____
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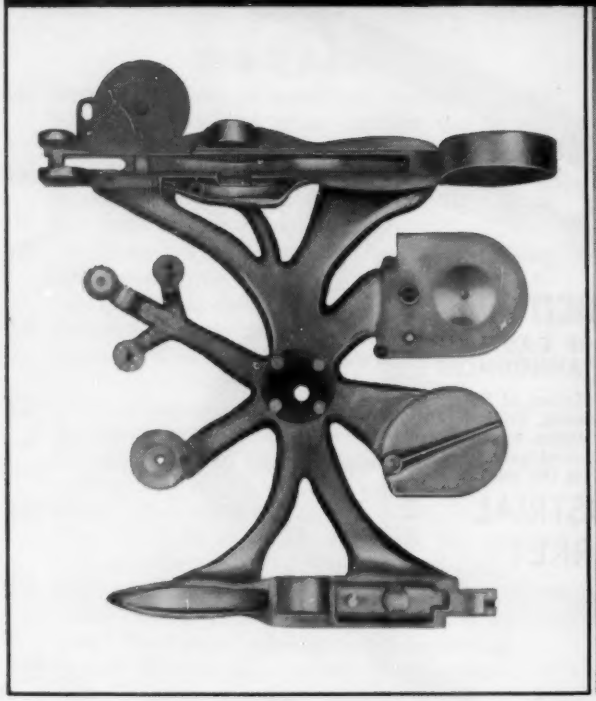
Company_____ **Address**_____

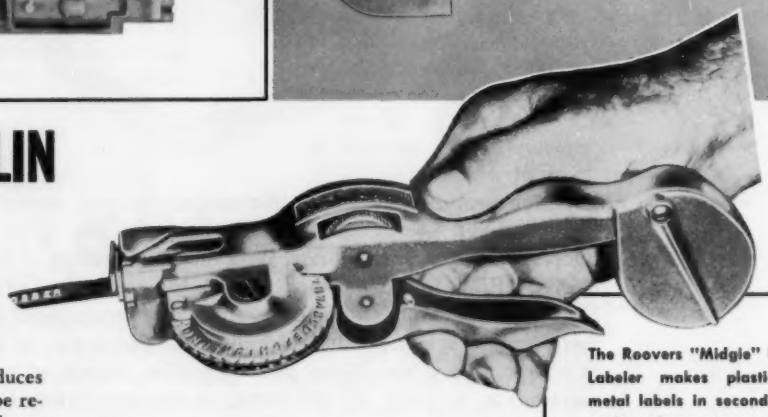
Circle No. 37 on Reader Service Card

One Die—One Shot . . . 8 PARTS!



Die-Cast by DOLLIN for Roovers "Midgie" Labelers

Each high-speed casting shot produces a gate containing body, handle, tape reset wheel, tape magazine cover, embossing wheel bottom plate and ratchet wheels. Subsequent trimming by Dollin delivers these zinc die-cast parts with close accuracies and a smooth hardware finish, ready for finishing and assembly . . . at low piece cost. The original combination die, with occasional design changes, is still in first class condition, after 19 years and 150,000 shots.



Is there an idea here for you? Dollin welcomes the opportunity to study your requirements and apply similar ingenuity and savings in die-casting your parts. Long experience — skilled die-makers — extensive equipment enable Dollin to produce your zinc and aluminum die-castings from large size down to fractions of an ounce, at lowest cost.

The Roovers "Midgie" Hand Labeler makes plastic or metal labels in seconds, by embossing permanently raised characters on strips of Monel, stainless steel, aluminum, copper, lead or vinyl plastic. Simply dial the letter or numeral and squeeze the handle. Manufactured by Roovers-Letsch Corporation.

DOLLIN CORPORATION 25th ANNIVERSARY 1934-1959 Die-Castings

Submit prints or samples of parts for engineering advice and quotation, without obligation. Write for 16-page brochure showing Dollin's facilities and services.

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See "Yellow Pages" for nearest office.

DOLLIN Zinc & Aluminum DIE-CASTINGS

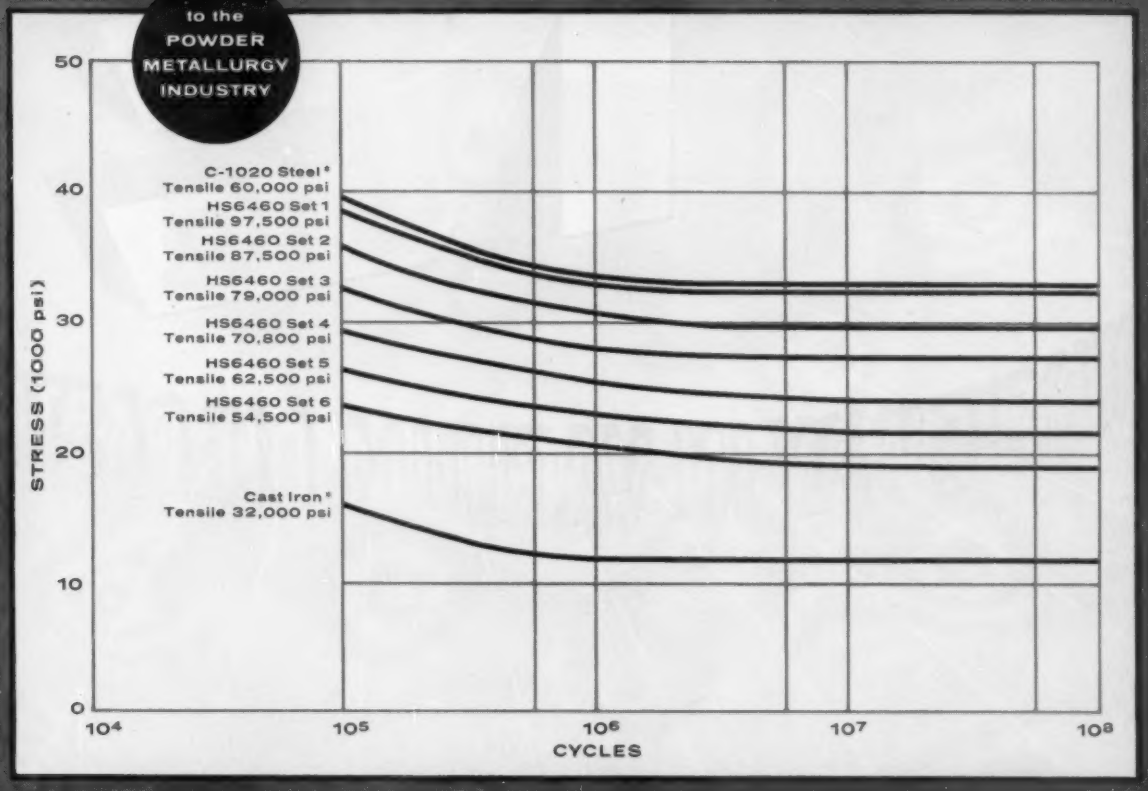
Circle No. 25 on Reader Service Card

REPUBLIC PROGRESS REPORT

to the POWDER METALLURGY INDUSTRY

ADDITIONAL FATIGUE TEST DATA

Republic HS6460 High Strength Powder (0.80% combined carbon) compared with C-1020 Steel and Cast Iron



Procedure Used to Obtain Test Results

Material—Republic High Strength Powder, Type HS6460, with 1% zinc stearate. Single press and sintered blank, machined to standard A.S.T.M. Fatigue Bar, .300" diameter, 3½" radius. Testing machine, R. R. Moore Rotating Test Beam.

Sintering conditions for Sets 1 through 6—Endothermic atmosphere, dew point +25°F, 2050°F, 45 minutes at heat (extended time because of size). Sintered densities, Set 1—7.2 gm/cc, Set 2—7.0 gm/cc, Set 3—6.8 gm/cc, Set 4—6.6 gm/cc, Set 5—6.4 gm/cc, and Set 6—6.2 gm/cc.

*Data on C-1020 hot rolled steel and cast iron obtained from ASM Handbook, 1948 Edition, Page 119.

For more information, write Republic Steel, Department PM-8971, 1441 Republic Building, Cleveland 1, Ohio.

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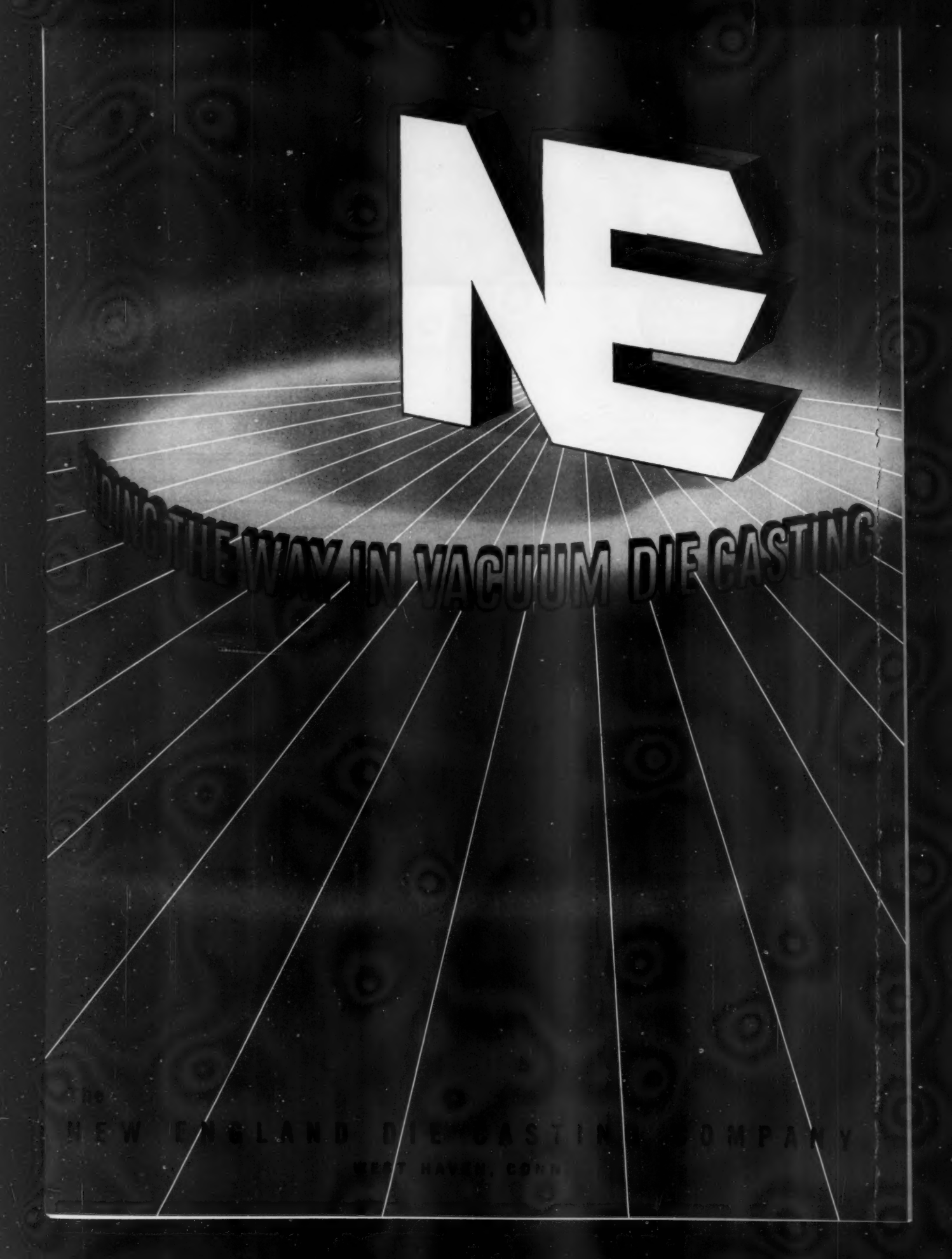

NE
LEADING THE WAY IN VACUUM DIE CASTING
The
NEW ENGLAND DIE CASTING COMPANY
WEST HAVEN, CONN.

A custom die caster speaks about . . .

BUYER - VENDOR RELATIONS

BY L. E. CAPEK *Vice-President, Sales, Du-Wel Metal Products, Inc.*

PURCHASING AGENT: "The castings you've been delivering aren't at all acceptable. Look here! We want the as cast finish better than you have been shipping. This blind hole must have only 30 minutes taper and you're consistently running 1°. With the taper in the mating part we just can't get them together. And this machined surface should be no rougher than 125 microinches; these castings run from 150 microinches to worse. *Sure these points are not on the print but you should have known it.*"

DIE CASTER: "O.K., if that's what you want. Why then didn't you say so and define it all when you asked for a quotation? We costed and bid this job according to the blueprints and specifications you submitted. You even approved the samples. Now you're dissatisfied. Is it because that now that you are in production you've discovered that you didn't specify everything you needed? Now then, who will pay for it."

WHO'S FAULT IS IT?

How many times have customers and vendors gone through just this sort of discussion? When the parties are reasonable, they reach a just settlement. But sometimes one or both gets tough, and then the fat's in the fire. Isn't it a lot better to work out all details of what's important and what isn't at first? (Unless the buyer deliberately holds back information so he can work out "fringe benefits" at no cost later.) What's more, if the original drawings and specifications are sufficiently detailed and accurate, then every vendor bids equally on the same piece. This lets the buyer select his vendor more intelligently.

How do you do this? Here are a few suggestions based on my experience that work for us with our customers. I believe that if all buyers of die castings

followed this sort of a system the market for die castings would expand because dissatisfied customers would become rare.

Let's get one thing straight. Neither buyer nor vendor should ever be able to point a finger and say, "It's your fault". When that happens it almost always means that at the start, when the bid was made and accepted, the two parties were not talking the same language.

Who can do the most to avoid misunderstandings and rejected castings? The buyer. He's in the driver's seat. A reliable vendor supplies what he is asked for. If he misunderstands, it's mostly due to incomplete or vague specifications. If he is not a reliable vendor then he won't be in business for long.

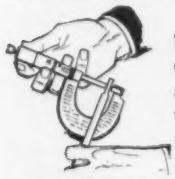
WHAT CAN THE BUYER DO?

DESIGN

Now let's see what the purchaser can do. When designing a die casting the design group creates the part or assembly of parts. They have lived with it from the beginning and possibly they can get into a rut. No reflection on them but it is always a good policy to have a fresh design group review their work. With this fresh point of view the second group can check the practical manufacturing as well as the functional design. They can often easily see improved design and/or better manufacturing methods. They may pick up tolerances that are improperly specified or possibly find how to combine several parts into one casting, etc. This second group may also examine to determine if perhaps a less expensive material will do the job adequately, etc.

Now get both design groups together to approve or reject the changes which have been suggested. This check and double check should pay big product design dividends.

QUALITY CONTROL



Next it's time for the quality control people to step in. They must decide if the designers have been realistic in their desires and whether with normal statistical quality control techniques, enough parts can pass inspection for satisfactory and economical production. If the design and tolerances are poorly conceived then they'll have to put in stricter inspection standards to get needed quality. This quality control group must also help decide whether the product performance is satisfactory at a given acceptable quality level or whether an unreasonably high A.Q. level must be held for the design to work properly on total output.

PRODUCTION

The Manufacturing group must examine the part too. They usually can predict manufacturing difficulties and should be given the opportunity to take steps to avoid them. Too, manufacturing may be able to suggest design changes which will lower manufacturing costs and/or improve the product.

PURCHASING

This is the time for purchasing to get in on the act. They should check the design and other specifications and determine if it is possible to produce and buy the part economically from known and proven suppliers using the most modern technology. Purchasing will know whether there are vendors who can make the part to specifications, deliver on schedule, who have the capacity, and are financially able to accept the order.

Before the buyer asks for bids, it is a good practice to make one more check. Call in a few representative vendors. Have them go over the drawings and specifications to decide if the requirements can be met at a reasonable price. The vendors will also help find buried errors and probably also determine short cuts and minor changes which would result in a less costly casting or more satisfactory quality. Be sure that the vendors also study the part with tooling in mind. Sometimes a minor change on the part can make a big difference in the cost of tooling. Only now is it time to issue the final blueprints and specifications.

Here are some of the data you should give a vendor when he is asked to bid:

1. The final blueprints.
2. The metallurgical specifications.
3. The physical testing procedures to be used where necessary, by both buyer and vendor. These should be detailed.
4. Standardized method of dimensional gauging. Furnish drawings of the gauges if they are not standard.
5. A quality attribute chart. Show key dimensions and other quality characteristics and locating points and surfaces. Give notes as to their importance.
6. Specify the quality levels needed.
7. Give packaging and transportation requirements.
8. Give time requirements. When tooling, samples and first production are required. Also give delivery schedule.
9. Estimate the number of parts needed per model year. Also estimate possible peak periods and duration of model.
10. Set up a system of quality and metallurgical certifications. These certifications should accompany every shipment from the vendor.

WHAT'S THE RESULT?

All of these suggestions add up to only one thing — maintenance of quality at a minimum of cost and a minimum of trouble and finally, helping the buyer get what he needs. To determine and maintain an acceptable quality level can cause a lot of trouble — especially if you try to do it after a bid has been made and accepted. Buyers should remember also that every bid is made with an estimated scrap loss in the vendor's plant. A change which might seem minor to the buyer can sometimes increase scrap by 10%, 20% or more. Often minor changes can also reduce scrap and ultimate costs by this same amount. Working closely with the die caster can often save many product dollars for the buyer.

During production where acceptable quality levels and standards are a source of argument, the fault almost always was the failure to agree at the start on quality levels acceptable to both buyer and vendor.

To help define areas where we have found that the most serious disagreement can arise we have an information form we suggest that the buyer fill in. This form then becomes a part of the bid and of the specifications. Try it or some appropriate variation and see if it can help you do a better job.

DETAIL REQUIREMENT DATA

CUSTOMER _____

PART NUMBER _____ DATE _____

The following information does not usually appear on a blueprint but is necessary if your detail requirements are to be understood to your satisfaction. These elements affect your cost and are given careful consideration in our quotation to arrive at the most accurate evaluation of your needs. A copy of this data should be kept by you for reference. Our copy will become a part of specifications for our inspection control.

CONDITION:

_____A. Some accumulated coolant residue and chips not objectionable. Castings to be cleaned up by plater or customer.
_____B. Shop run – Reasonably clean as possible without washing operation.
_____C. Castings to be washed in solution and dried before packing.

CAST SURFACE FINISH:

_____A. Commercial – Part used where finish is unimportant. Reasonable care only.
_____B. Commercial Paint – Some streaks and chill areas that can be covered with normal prime and finish cost smooth or wrinkle paint.
_____C. Commercial Chrome – (zinc only) Suitable for ornamental or display purpose.

FLASH REMOVAL:
Parting Line

_____A. No die trim, break off runner and long flash only.
_____B. Commercial die trim to within approximately .015 of casting.
_____C. Hand filed or polished flush with casting surface.

EJECTOR PIN:

_____A. No removal – Reasonable care only.
_____B. Commercial – Except in cored holes as identified by you.
_____C. Important – Held to minimum, in areas identified by you, as can be controlled by sample inspection.

PRESSURE TEST:

_____A. No requirement.
_____B. To be pressure tested at agreed P.S.I. and, or impregnated.

STRAIGHTENING:

_____A. No requirement.
_____B. Critical at identified area – to be checked 100%.

DIMENSIONS:

_____A. No special requirement, average control sufficient.
_____B. Semi-Critical – only a small portion of the dimensions to be closely controlled as identified.
_____C. Part of precision assembly – all dimensions identified to be gaged 100%.

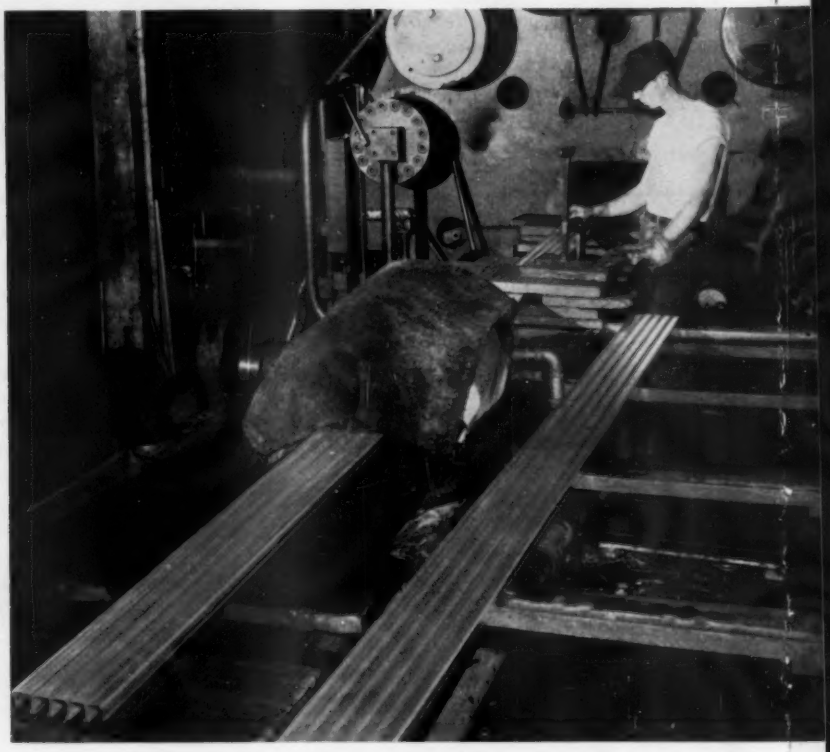
QUALITY LEVEL OF YOUR RECEIVING INSPECTION:

_____A. Commercial – Reasonable control.
_____B. Accept shipment, but return rejects.
_____C. Statistical quality control – Reject entire shipment on A.Q.L. method.

PACKAGING:

_____A. Not critical – bulk loose packed.
_____B. Orderly packed with some pad separators.
_____C. Packed carefully in cell type separators.

DESIGN FOR
EXTRUSIONS



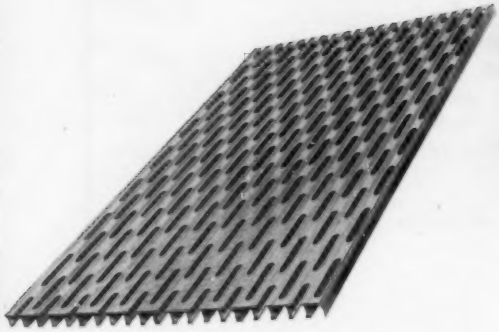


FIG. 1 A finished grating.

LOCKING ALUMINUM SECTIONS

. . . For light, strong grating

by DONALD C. GRAHAM *Chief Engineer, Capitol Products Corp., Read Standard Div.*

What makes a good industrial grating? Strength, certainly. Light weight, that's desirable. Easy assembly and erection, both important. Most of these qualities are secured by using aluminum I-beams separated with spacers and bolted together in any desired width. But these gratings are expensive. They take a lot of material and need too much direct labor to assemble. What's more, their strength to weight ratio is low and they must be shop assembled.

Redesign of the I-beam grating led to an entirely new design with a high strength to weight ratio, low material cost, and very low direct labor costs for assembly. One big advantage of the new grating is fast field assembly.

How was it done – with extrusions.

A finished grating is shown in figure 1. It is built up from standard extruded sections 6″ wide, furnished in three thicknesses; 1″, 1¼″, and 1½″. Lengths are furnished as specified.

A typical section is shown in figure 2. The key to the success of this grating is the locking method used to hold the panels together. Details of the lock are shown in figures 3a and 3b. This design distributes the stresses so that horizontal movement is prevented by the interlock of surfaces A and B. Vertical movement is prevented by the interlock at surfaces A, B, and C. These locking surfaces prevent any movement

continued on page 56

TABLE I

Allowable Loads Based on a Maximum Fiber Stress of 10,000 psi. Loads in Lbs.; Deflection in inches.

	Span	2'	3'	4'	5'	6'	7'	8'	9'
1 Inch	Concentrated Load	703	469	352	281	234			
Punched	Deflection	.078"	.176"	.313"	.488"	.700"			
Panel	Load Per Sq. Ft.	703	313	176	113	78			
2.470 Lbs.	Total Load Allowable	1406	938	703	563	469			
Per Sq. Ft.	Deflection	.098"	.220"	.390"	.610"	.876"			
1¼ Inch	Concentrated Load	1192	795	596	477	398	341		
Punched	Deflection	.067"	.151"	.269"	.420"	.605"	.822"		
Panel	Load Per Sq. Ft.	1192	530	298	191	133	97		
3.103 Lbs.	Total Load Allowable	2384	1590	1192	954	796	682		
Per Sq. Ft.	Deflection	.084"	.188"	.336"	.524"	.753"	1.027"		
1½ Inch	Concentrated Load	1810	1205	903	723	602	516	451	401
Punched	Deflection	.059"	.132"	.235"	.367"	.527"	.720"	.940"	1.190"
Panel	Load Per Sq. Ft.	1810	803	453	289	201	148	113	89
3.543 Lbs.	Total Load Allowable	3620	2410	1810	1445	1205	1033	905	804
Per Sq. Ft.	Deflection	.074"	.165"	.294"	.459"	.659"	.900"	1.177"	1.488"
Allowable Loads Based on a Maximum Deflection of 1/200 of the Span									
	Span	**2'**	**3'**	**4'**	**5'**	**6'**	**7'**	**8'**	**9'**
1" Punched	Concentrated Load	1080	480	270	173	121			
Panel	Load Per Sq. Ft.	863	256	108	56	32			
1¼" Punched	Concentrated Load	2130	950	533	341	238	174		
Panel	Load Per Sq. Ft.	1430	422	178	91	53	33		
1½" Punched	Concentrated Load	3685	1640	923	590	412	302	231	183
Panel	Load Per Sq. Ft.	2950	873	369	189	110	69	46	32

The SHADED AREA indicates safe maximum spans when the grating is used for normal foot traffic.

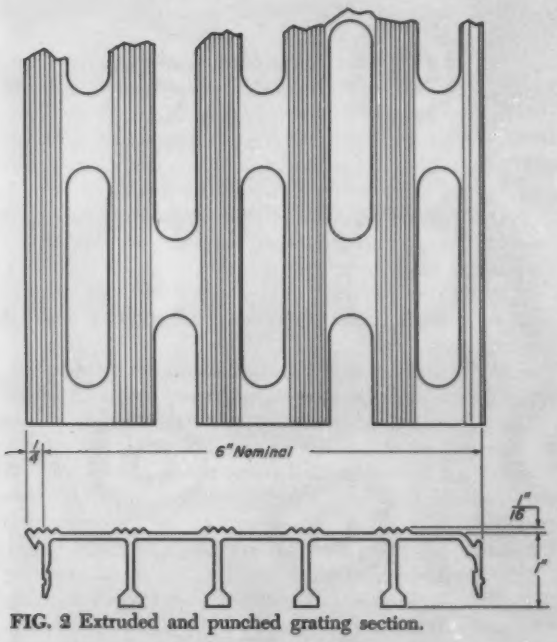


FIG. 2 Extruded and punched grating section.

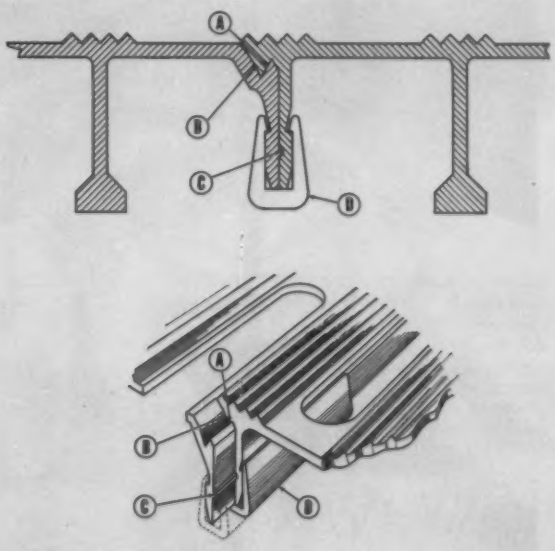


FIG. 3 Details of locking method. a (top) general view, b (bottom) detail.

MAJOR CAMERA PRODUCER CHOOSES DIE CASTING FOR PARTS

BY HENRY LEFER, *Eastern Editor*

ARGUS CAMERAS IS BETTING that design is the key to success in the highly competitive amateur camera field. And the company's chief design consultant, Harley Earl Associates, is betting that use of die castings is the most economical way to achieve crisp attractive design.

A new group of cameras and projectors, recently introduced by Argus, all feature wide use of die castings. And one of the models – the Cinetronic M3 movie cameras – has been selected by the Industrial Designers Institute as one of the three best designs of the year.

WINNING TEAM of industrial designers, Dominic Saporito (left), Fred Hertzler (center), and Ray Grosso (right); all of Harley Earl Associates. Their design of the Argus Cinetronic M3 camera shown was an award winner because of the wide use of die castings for major parts.

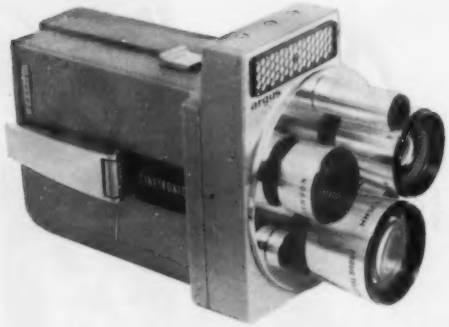
The Harley Earl team which created the winning design gives major credit for the award to its decision to use die castings, finished in chrome or textured vinyl. The styling emphasizes what the designer calls the "contour look," while maintaining a crisp, machine-like appearance in keeping with the product itself.

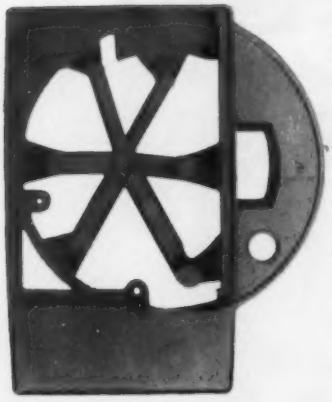
The factors that tipped the decision in die casting's favor were these, according to the designers:

- No other process could give the required accuracy in component parts. In the case of the superstructure for the C33 camera, for example, die casting was mandatory to maintain the dimensional tolerances required for mounting optical and other functional components.
- Die casting reduces the number of parts required. In the Model 750 Showmaster projector, the use of one major central die-casting (page 36) makes it possible to mount all the required mechanisms, and provides a simple background for a complex control system, giving unity and solidity to the product.
- Die casting eliminates difficulties in arriving at desired forms and contours, because it has fewer limitations than stampings.
- With die castings, it's possible to use thinner sections than if some other material, such as molded plastics, was used.
- With die castings, finishes could be applied directly; with plastics, they would have to be attached.

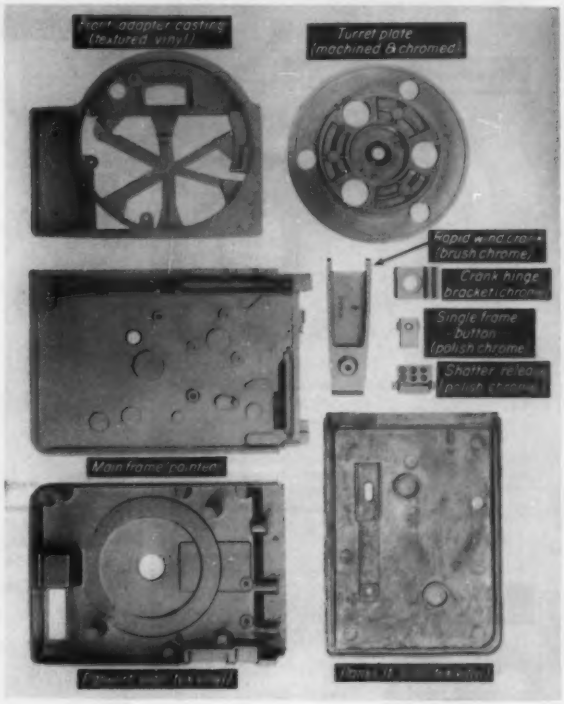
Some of the finishes on the new Argus products are in themselves unusual. For instance, on most of the housings, a new organisol paint is used, which has a vinyl plastic base and can be applied in various textured manners. This is believed to be the first time this finish has been used on camera equipment.

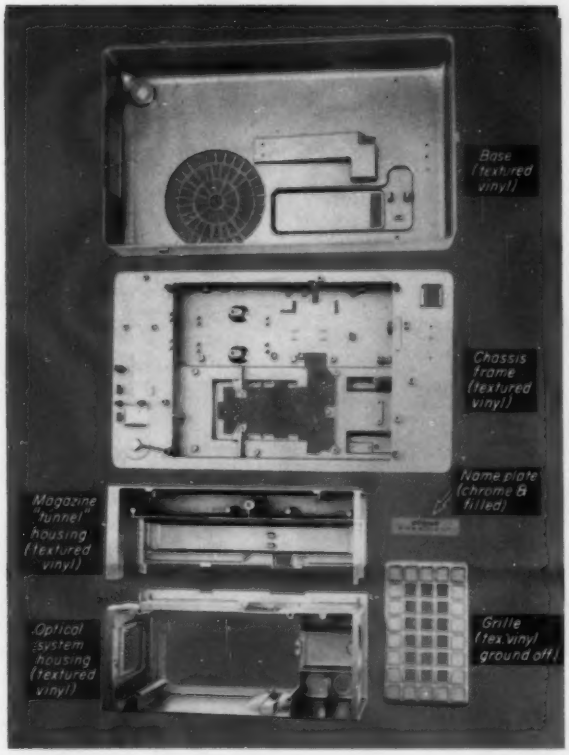
The vinyl-textured finish requires less hand-finishing than other types, and has very good abrasion-and scuff-resistance. It can be applied by hand or automatically. Argus applies it with an electrostatic spray process.



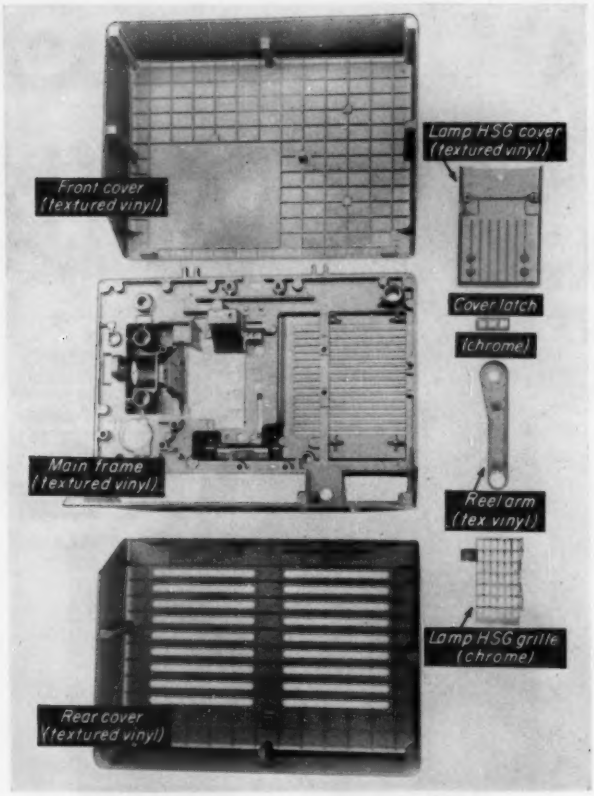


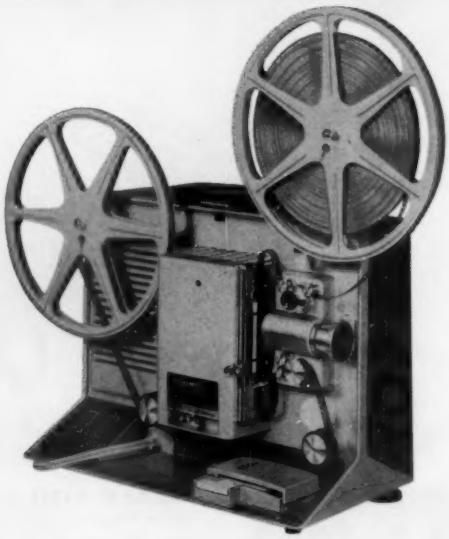
DIE CAST PARTS in the prize winning movie camera. The use of die castings allows a uniform finish, gives solidity and uniformity and eliminates the problem of co-ordinating different materials and processes. The turret plate could hardly have been made by any other process.



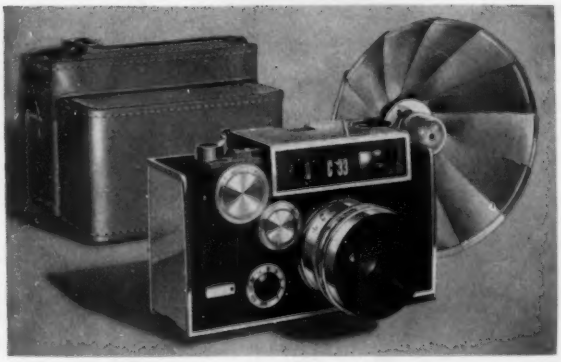

Base (textured vinyl)
Chassis frame (textured vinyl)
Name plate (chrome & filled)
Magazine "tunnel" housing (textured vinyl)
Optical system housing (textured vinyl)
Grille (tex.vinyl ground off)

ZINC DIE CASTINGS are almost the only material of construction which can stand the high temperatures generated in this projector and remain dimensionally stable. A top-price projector, die casting gives a quality appearance not possible with any other process.

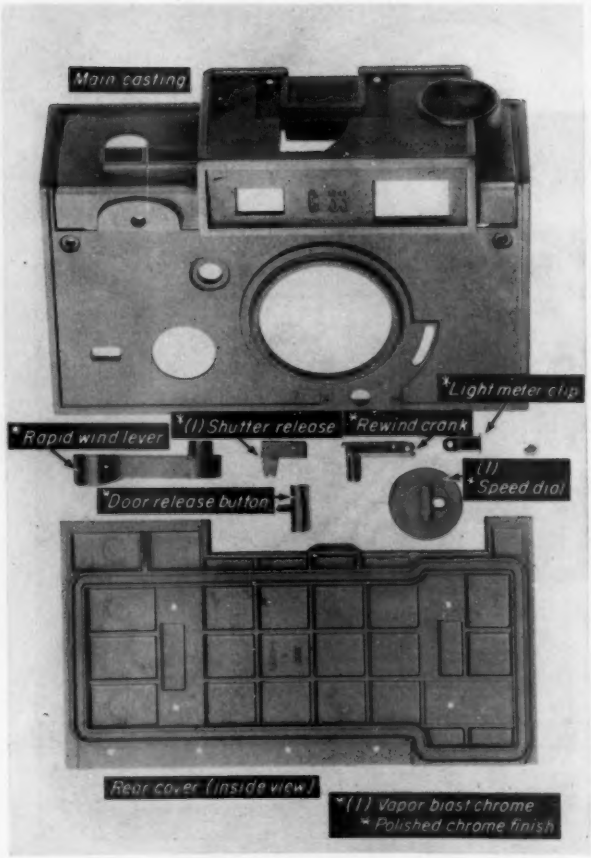

Front cover (textured vinyl)
Lamp HSG cover (textured vinyl)
Cover latch (chrome)
Main frame (textured vinyl)
Reel arm (tex vinyl)
Lamp HSG grille (chrome)
Rear cover (textured vinyl)



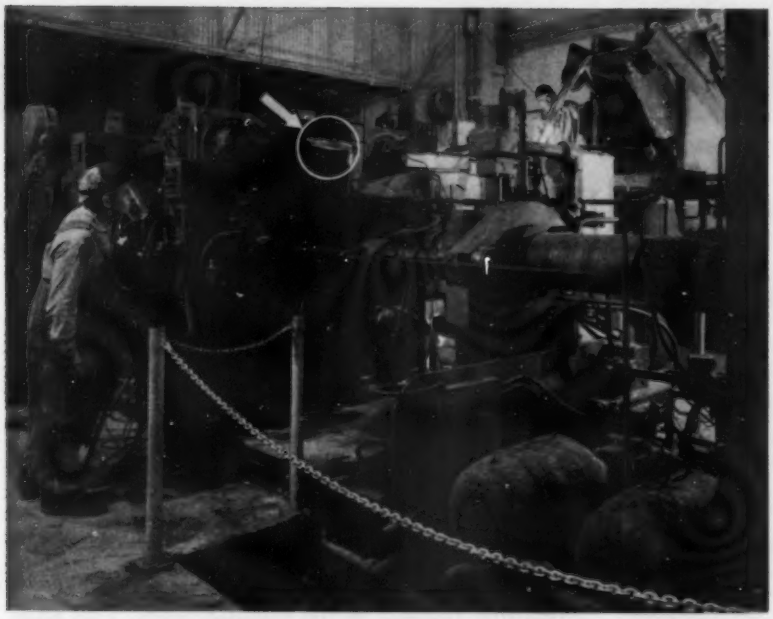
BOTH ALUMINUM & ZINC are used in this movie projector. The surface finish applied is indicated for each casting. Both the lamp housing grill and the cover latch are cast in zinc, the balance are cast in aluminum.



ONLY ZINC die castings are used in this 35mm camera. Main casting and rear cover are shown in finished, normal finish is grain (vapor blast) chromium. Finish on other parts is bright chromium. The main casting is finished with black leatherette.



METAL HANDLING
. . . Key to Efficient Operation



A KEY to efficient operation is the accurate, automatic metering of molten magnesium possible. Here an automatic metering device is shown (circled) on a 1000 ton cold chamber die casting machine.

TECHNOLOGICAL ADVANCES in magnesium are making die castings in this metal competitive with both zinc and aluminum base die castings.

The new die casting plant recently installed by Dow Metal Products Co., Div. of The Dow Chemical Co. at Bay City, Mich. is capable of die casting both aluminum and magnesium. The key to efficient operation of this plant is in its modern methods of handling both molten metal and plant generated scrap.

In addition to casting facilities, the new plant will have complete machining and surface finishing facilities. The finishing will include Dow 1, Dow 7, Dow 9, Dow 17, and HAE treatments. There will also be facilities for painting, barrel finishing, and sand and shot blasting.

CONVERSION from magnesium to aluminum is simple with both aluminum reverbatory furnaces and magnesium holding pots.

MOLTEN METAL is transfered from a tilting, holding furnace to a crucible supported on a fork truck. Distribution will be to the casting floor.

GENERATED SCRAP from the die casting machines and trim presses is carried by belt conveyor to remelt furnaces.

DESIGN FOR
INVESTMENT CASTINGS

HIGH QUALITY STRUCTURAL

by W. R. ROSER and K. E. KUSCHELL *Metallurgical Engrs., Norair, A Div. of Northrop Corp.*

IN THE DESIGN of the T-38 "Talon" supersonic Jet Trainer, Norair attempted to produce an airplane capable of century series fighter performance without their high cost and weight. Many design innovations were used including the use of investment castings as prime structural components. Approximately 18 different castings are used. A high percentage is critical with respect to pilot safety, and the safe performance of the aircraft.

17-4PH was chosen due to its good corrosion-resistance properties, high strength and ductility, and castability. The castings were produced to the Norair specification, equivalent to the AMS Specification 5355. No problems other than the routine ones were anticipated.

Normal inspection showed that some castings had failed to respond properly to heat treatment. The trouble was traced to carbon and nitrogen picked up in carbon arc melting. The foundry was advised of the trouble and was requested to change to induction melting, no further trouble of this type was encountered. The problem caused doubts about the integrity of all 17-4PH castings. An investigation showed that the castings had adequate strength in all cases (with the above-mentioned exception), but approximately 90 per cent of them had ductility far below the required 6% minimum elongation. In many cases the tensile specimen fractured before a 0.2% offset yield could be obtained. This could not be tolerated in structural applications.

All castings were well within the specified chemical composition ranges, and all were completely X-ray sound. The cause for the poor ductility was found by the metallographic analysis to be due to micro shrinkage and the formation of dendritic delta ferrite.

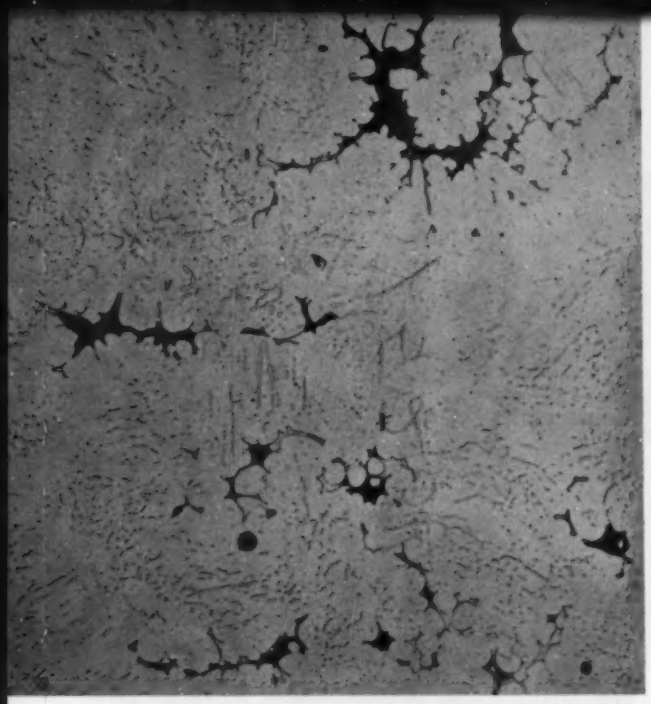
Fig. 1 is an example of microshrinkage, one of the most prevalent causes for poor ductility. Microshrinkage of this type was found mostly in castings and test bars from a foundry which used a shell-type mold and poured without pre-heating. The rapid cooling is probably responsible for microshrinkage. This same fault was found in a few castings produced by other foundries not using shell molds, but these cases were rare and the causes could be attributed to poor gating practices.

Fig. 2 illustrates the most troublesome condition encountered. The dentritic delta ferrite shown here severely reduced ductility. In the study of many brittle fractures, the fracture path could be traced along the martensite-ferrite interface. This condition was found in castings produced by both shell and investment methods. However, it was more severe in the "shell" produced castings.

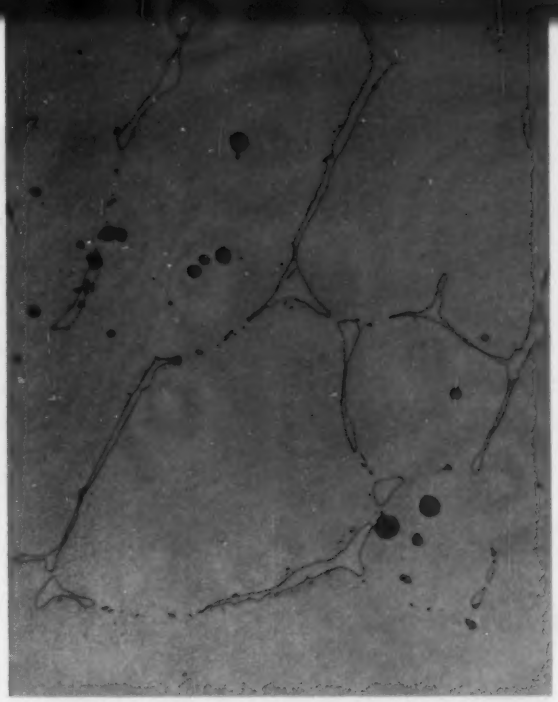
Fig. 3 shows the optimum microstructure. This type of structure that was found in castings exhibiting good ductility and strength.

Solution to the problem of microshrinkage was strictly a foundry responsibility and was not considered as serious as the low ductility resulting from excessive or at least the dendritic structure delta ferrite.

The trouble apparently stemmed from two causes. One was that even though the chemical composition was within the specification ranges the resultant properties of the casting did not necessarily meet the re-



1. **MICROSHRINKAGE** in cast 17-4PH steel. 100X



2. **DELTA FERRITE** in cast 17-4PH steel. 500X

17-4PH CASTINGS

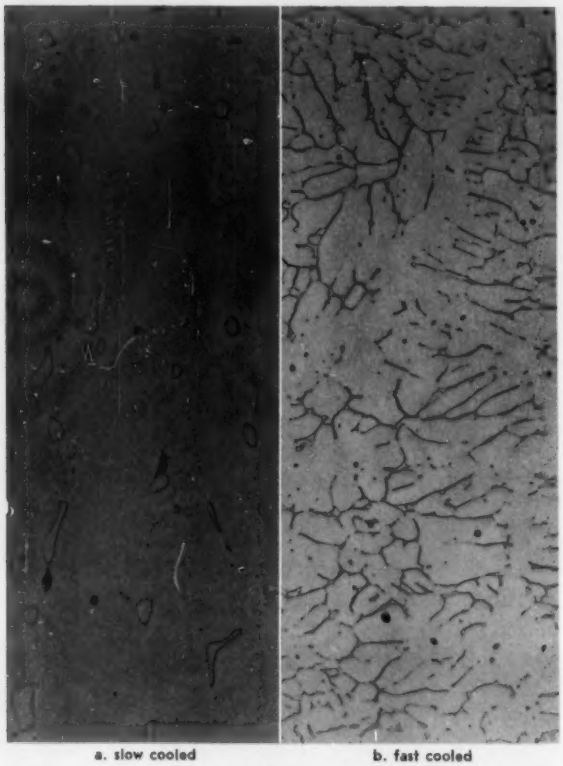
3. **HIGH QUALITY** cast 17-4PH steel. 500X

quired properties, especially the ductility. Although the chemical composition ranges are important, their control does not entirely solve the problem of low ductility.

The second problem was the effect of varying cooling rates on the ferrite formed. The shape and amount of ferrite in the castings could not be changed through normal heat treatment. Therefore, control of the ferrite formed was dependent upon the cooling rate of the cast metal as well as the composition limits. Figure 4b illustrates the dendritic pattern of the ferrite obtained during rapid cooling of the cast metal. Figure 4a shows the well-dispersed globular type of ferrite resulting from slow furnace cooling of the cast metal.

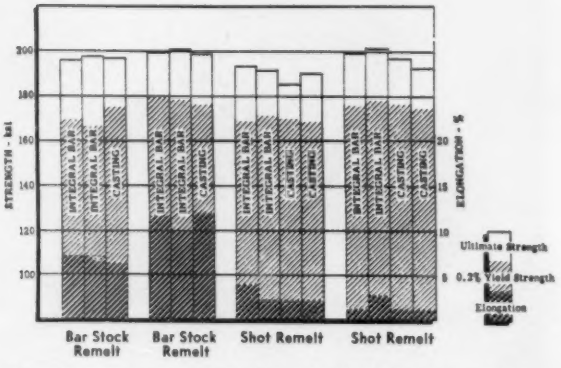
While heat treatments were of no value in elimination or reshaping of the ferrite, it was found that evidently some inhomogeneity existed in the cast structure (probably a segregation of copper on a submicroscopic scale). It was necessary to homogenize by heat treatment at 2100°F Table I gives the effects of this homogenization. As a result, an homogenization heat treatment has become mandatory for 17-4PH castings. The findings point up the need for close control of every step of the casting process including the production of remelt stock and final processing.

Some means must be found to assure the user of castings that the properties meet his requirements. Seeming subtle differences in casting production make large differences in the final product. The only sure method of determining a casting's worth is by destructive testing — sure but extremely impractical. Hardness tests are of no value, X-rays disclose only gross defects, and chemical analyses are of little value. Inspection methods had to be developed which would give a truer indication of the mechanical properties of the casting. The best method is integrally cast test bars. Figure 5 is the correlation between properties of integral bars and those of castings. The notes at the bottom of the bar graphs indicate the results obtained from balanced chemistry bar stock, and unbalanced chemistry shotted remelt stock. The graph

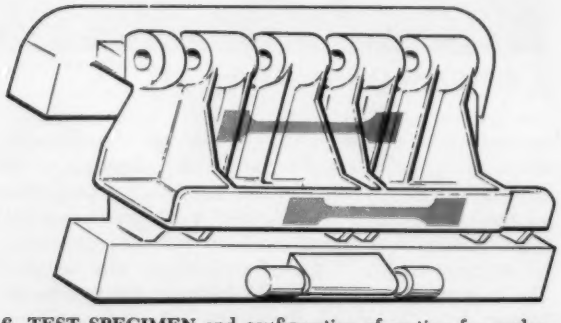


a. slow cooled b. fast cooled

4. EFFECT OF rate of cooling on the structure of cast 17-4PH steel. 500X



5. TENSILE strength and elongation for dissected castings.



6. TEST SPECIMEN and configuration of casting for evaluation.

shows that a good correlation exists.

It is now our policy to require two integral bars be cast in each flask of critical investment castings. The first three lots of castings are subjected to destructive testing of one casting per lot to establish the correlation. After that, the results of tests on these bars along with the regular inspection tests provide the basis for acceptance of these castings. A random 2% destructive inspection is conducted as a check. Figure 6 shows one of the castings with the placement of the integral bars on the gating.

This study showed that 17-4PH is a very sensitive alloy. It requires close chemistry control and precise foundry techniques. To produce prime structural castings of high standards and consistent quality, constant control of foundry practices and heat treatment must be maintained.

Why not substitute another alloy which is not as critical as 17-4PH? Thus far, no alloy has been found that would be any better. The alloy has advantages which no other alloy of the required strength has. However, it is not the intention of this paper to imply that 17-4PH is the ultimate. Other alloys are being considered and will be tested.

In the use of castings the problem does not necessarily lie in the alloy, but rather in the knowledge of possible troubles and their elimination through tighter specifications and further research and development in the casting field. Castings have not kept pace with the rest of the industry, but they are an excellent means of reducing both volume and weight of structures economically.

While castings offer many design advantages, many designers have become very gun shy. They feel that castings should be used only as hardware. Actually, there are many critical structural applications which are now forgings or wrought parts which could well be made as castings if proper foundry control is exercised.

(Note: This paper was originally presented at the SAE National Aeronautic Meeting. Los Angeles, October, 1959.)

TABLE I

Test Bar No.	Heat Treatment	Yield Strength (.2% Offset) ksi	Ultimate Strength ksi	Elongation % in/in.	Red. of Area %
1	1900 F. 1 hr.	171.8	192.7	3.5	7.8
2	Oil Quench	171.8	192.7	5.5	8.6
3	Age 925 F. 1 hr.	168.3	189.0	3.0	4.0
	2100 F. 2 hr.				
4	Air Cool	175.7	194.3	11.0	24.7
5	Oil Quench	172.3	193.0	10.5	18.8
6	1900 F. 1 hr. Age 925 F. 1 hr.	173.8	194.3	10.0	25.4

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HOW EXPENSIVE ARE FIRE RESISTANT FLUIDS?

BY DEAN J. DEAKYNE, *Hydraulic & Lubrication Eng., Cleanese Corp. of America*

FIRE RESISTANT FLUIDS would not have been expensive for this manufacturer. *Photo courtesy Cleveland Plain Dealer.*

THE FIRST COST of a fire resistant fluid is from two to seven times that of a top quality petroleum oil. But the cost of using fire resistant fluids need not be this high. To hold costs down be sure that you select the right fluid for your job and be careful on installation, use, and maintenance of it.

When you choose a fire resistant fluid consider:

1. The first cost.
2. The installation cost.
3. The fluid characteristics.
4. Your operating conditions.
5. Your equipment, particularly your pumps.
6. The predictable maintenance costs.

To install fire resistant fluid in new equipment can be easy. Tell the machine manufacturer which fluid you're going to use. He'll install packings and seals which are compatable with the fluid. He'll furnish a pump which will handle the fluid. He'll see that there are no paints where the fluid can dissolve them. Finally, he'll fit the machine with the right filter.

If you're changing over an old installation, you'll have to make all adjustments yourself.

As far as the characteristics of the fluid are concerned, here are the ones you'll be most concerned with.

Flame-resistance: The ability to resist ignition by direct flame or hot surfaces, such as molten metal. Also the inability to support combustion or to propagate a flame.

Lubricity: Slipperiness – how much is friction between rubbing surfaces reduced. Also load carrying ability.

Stability: Resistance to changes in viscosity, fire resistance, and lubricity in normal operation.

Viscosity: The resistance of the fluid to flow.

Pumpability: Can the fluid be moved by a pump in the quantity needed at the required pressure, without damaging the pump.

Now how about operating conditions in your own plant. Will the fluid you've picked stand up? How about temperature extremes, will the fluid break down at the high temperatures you expect? Can you start up when the plant is cold? How about pressures? Can you operate the fluid at your machine pressures? Will it retain its lubricity and load carrying ability? Can it be reclaimed? What will accidental water contamination do to it? You have to answer all of these questions when you select a fluid.

Check the warranty on your equipment. Will it still hold if you change fluids? Can you expect normal wear or will it increase?

Finally consider predictable maintenance. Will packings and seals have to be replaced more often? Does the fluid protect against corrosion? Can you reclaim it to lower makeup costs?

So far, we've considered the points which help select a fire resistant fluid. Now let's review the different fluids. There are six general types. Water gives the first three their fire resistance. The others are inherently fire resistant. The cheapest is water followed by water-in-oil emulsion, water glycol, chlorinated-ester base, pure phosphate ester, and finally the halocarbons containing fluorine.

Water and the halocarbons are the best for fire resistance. But water doesn't lubricate, leads to excessive wear and corrosion. The halocarbons are excellent fluids, they cost from $150 to $200 per gallon.

WATER-IN-OIL EMULSIONS are about 40% water. The balance is light oil, emulsifiers, and additives. They are known as inverse emulsions.

ADVANTAGES:

1. Low cost. They are the cheapest safety fluid on the market, about twice the price of good petroleum oil.
2. Good compatibility. They don't effect seals, gaskets, packings or paints. Changeover is simple.

DISADVANTAGES:

1. Instability, some of the emulsions may break at low temperatures. Above 130°F water evaporates rapidly. Both lower fire resistance.
2. When the water content increases the viscosity actually decreases. This can cause cavitation and pump damage.
3. Generally the fire underwriters do not approve these fluids. They're better than petroleum fluids. Use them in sprinklered areas.
4. To prevent corrosion, use inhibitors.

WATER-GLYCOL FLUIDS are mixtures of water, glycol, thickeners, and additives. These are snuffer type fluids, their fire-resistance is from the water.

ADVANTAGES:

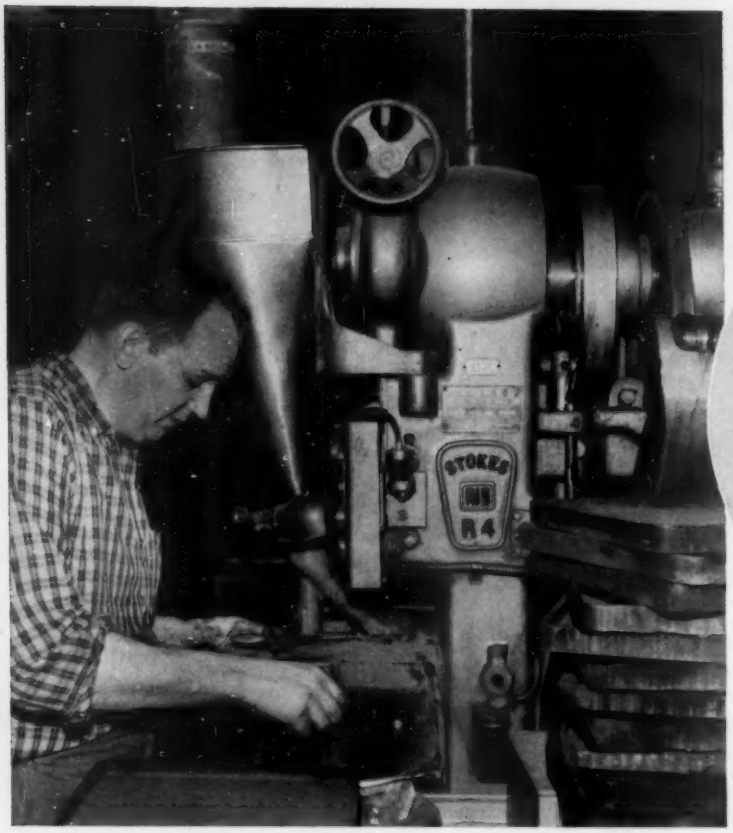
1. Less expensive than non-water types. About 3½ times the cost of oil.
2. Good compatibility with seals and packings.
3. Good fire resistance if water content is maintained. Approved as "less hazardous" by fire underwriters.
4. Good viscosity index and a low pour point.

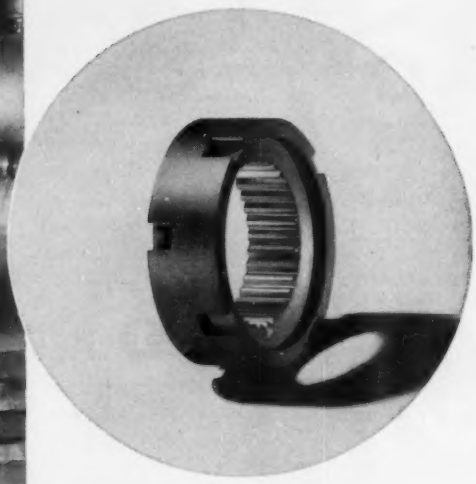
DISADVANTAGES:

1. Lubricity sometimes questionable. Care needed when used with some types of bearings.
2. They need inhibitors.
3. They may lose water above 130°F. The fire resistance may be reduced then.

PHOSPHATE ESTER BASE fluids are a mixture of phosphate esters (chlorinated biphenyl is one) and small amounts of additives.

continued on page 45





***68% SAVINGS** were realized on the piece shown above—a tractor part made from an iron base metal powder and having a tensile strength of 65,000 psi and an average hardness of 65 Rockwell B. The part was previously made by screw machine methods. At left, a Burgess-Norton operator checks the output of one of the Stokes R-4 Powder Metal Presses at the company's Geneva, Illinois, plant.*

"Quali-SINT"® produced by Burgess-Norton on Stokes powder metal presses

Burgess-Norton Mfg. Co., Geneva, Illinois, is a leading producer of a wide variety of parts by powder metallurgy—including cams, spacers, gears, adapters, ratchets and pawls. The company maintains its own extensive engineering, metallurgical, and chemical laboratories, tool-making, and secondary machining and grinding facilities.

Five Stokes powder metal presses are operated 5 days a week—16 hours a day—to keep pace with their production demands. The number of parts per minute depends on the part and the process being used—only minimum operator attention is required. All 5 presses were chosen by G. W. Waller, Vice President of Engineering, on the basis of "(1)—Production rate per dollar cost, (2)—Minimum maintenance requirements, and (3)—Price."

Continual research and advancement in the field of powder metallurgy has made Stokes the recognized leader in this modern industry. Stokes achievements may well be the answer to meeting your own production requirements economically—and at high speeds. Ask for complete information on the Stokes line of industrial compacting presses—or for assistance by Stokes Engineering Advisory Service. Call—or write—today.

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STOKES

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ADVANTAGES:
1. Good lubricity.
2. Good fire resistance even under abuse.
3. Need normal maintenance to stop contamination.
4. Easy reclamation. Water can be decanted off and foreign solids filtered out with mechanical filters.
5. Very stable, can be operated at higher temperatures and pressures than fluids containing water.

DISADVANTAGES:
1. High first cost, about 5 times the cost of oil.
2. Not compatable with most paints and lacquers. Needs special seals and packings.
3. The additives may become depleted. Will decrease viscosity and viscosity index.

PHOSPHATE ESTER FLUIDS are essentially pure phosphate esters. Some types may contain additives for special operating conditions.

ADVANTAGES:
1. Good lubricity.
2. Easy reclamation.
3. Good fire resistance.
4. Good stability.

DISADVANTAGES:
1. High first cost, about 5 times the cost of oil.
2. Poor compatibility with paints and lacquers. Needs special seals and packings.

Now if you've selected the fire resistant fluid best for your plant, how about maintenance of it. First set up a regular fluid check and machine maintenance program.

Be sure that all joints are tight and kept that way. Leakage can be very expensive. A small leak, not normally stopped can leak away a couple barrels of fluid or oil in a short time. That's $60 for oil, but it's as much as $300 for fire resistant fluid. Here are some pointers to help prevent leaks.

- Use joints and materials known to be satisfactory with your fluid.
- Make sure maintenance men know how to prepare and make up the joints.
- Have the fewest possible number of connections. Be sure they are easy to get at.
- Have all piping well supported.

Annealed hydraulic tubing is better than pipe. It bends easily, cuts out a lot of joints. Have as few bends as possible to decrease friction losses. Provide at least one bend for expansion and contraction due to temperature changes. The minimum tube bend should be three diameters.

Use straight threaded fittings with O rings; not tapered threads and pipe dope. If you have to use tapered threads, get dryseal type threads.

Use hose, compatible with your fluid, for flexible connections. Watch the joints where the hose joins

continued on page 56

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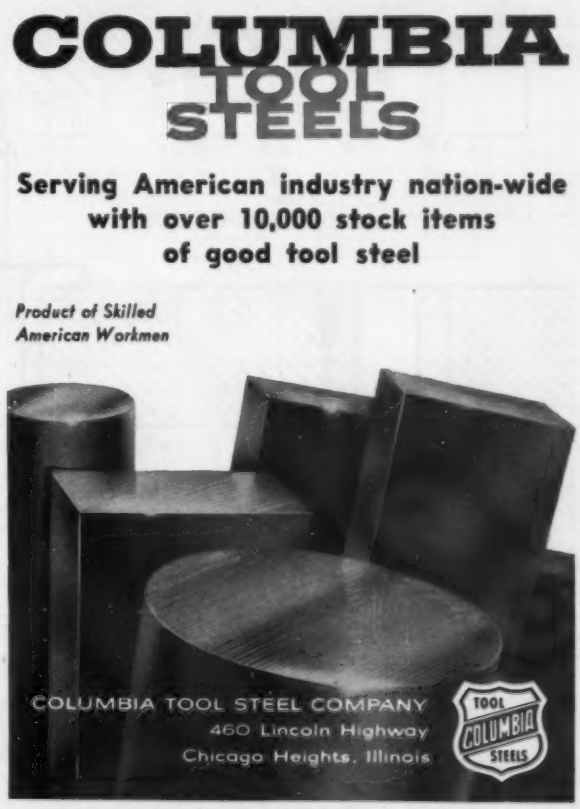
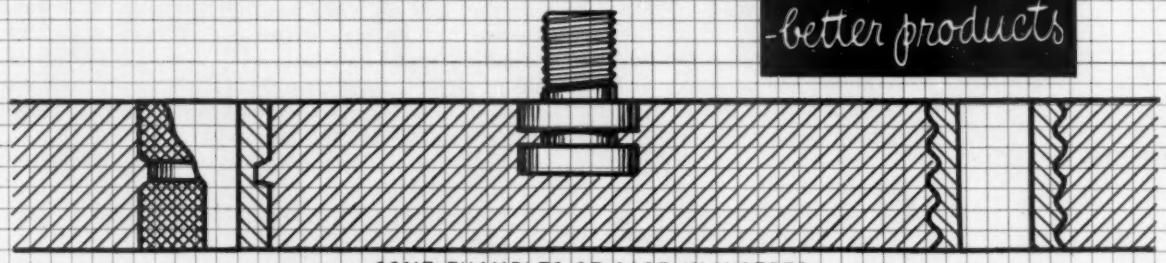


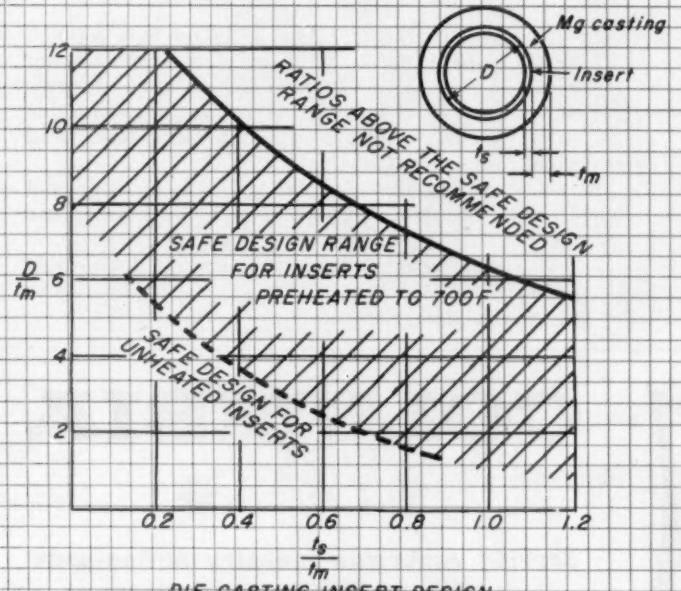
Circle No. 19 on Reader Service Card

Design data for inserts in magnesium die and permanent mold castings

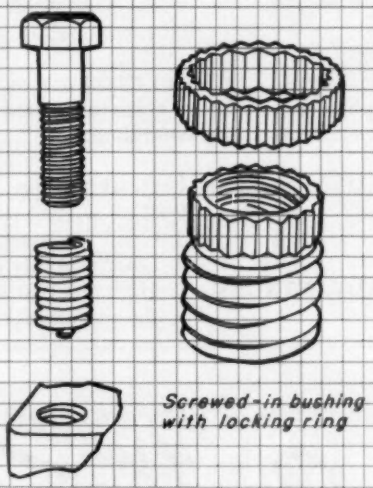
use these PMM **Design Tips** for lower costs -better products



SOME EXAMPLES OF CAST-IN INSERTS

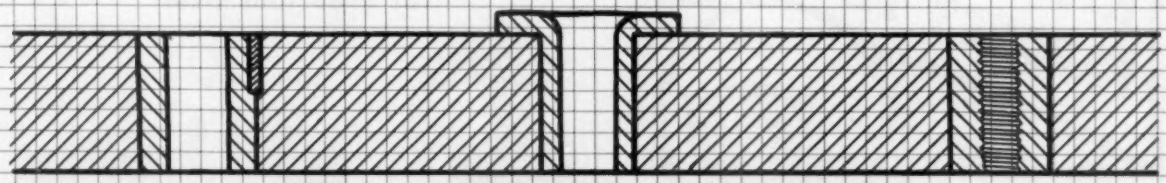


DIE CASTING INSERT DESIGN



Screwed-in bushing with locking ring

Screw thread bushing of helically coiled wire



SOME EXAMPLES OF SHRINK AND PRESS FIT INSERTS

Form	Ratio of inner to outer insert dia.	Interferences in inches per inch when surrounding metal is: very thin	1/4 insert dia.	1/2 insert dia.	Insert dia.
Cast	0.00	0.0006	0.0007	0.0007	0.0008
	0.50	.0006	.0007	.0008	.0009
	0.80	.0006	.0009	.0010	.0012
	0.90	.0006	.0011	.0014	.0017
	0.95	.0006	.0017	.0023	.0028

SUGGESTED MAXIMUM INTERFERENCES FOR PRESS-FIT AND SHRINK-FIT INSERTS IN MAGNESIUM IN NON-CORROSIVE MEDIA

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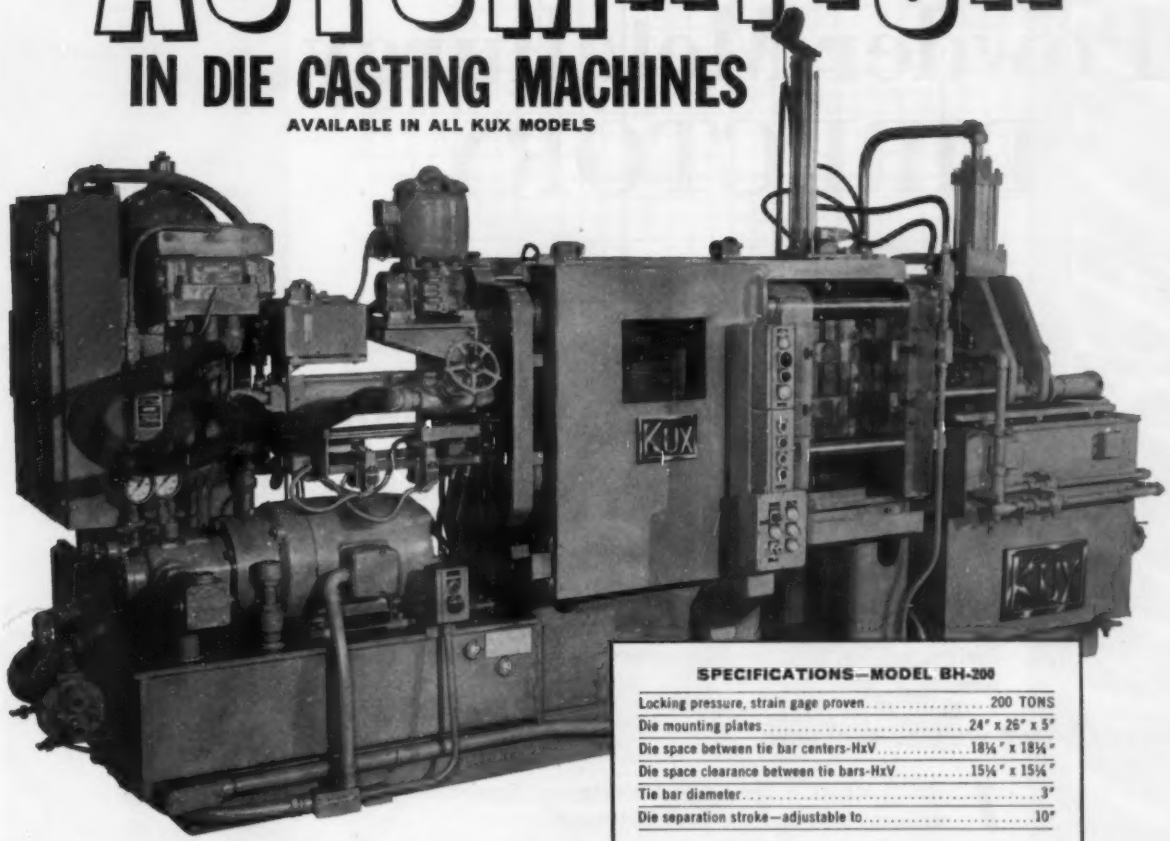

SPECIFICATIONS—MODEL BH-200

Locking pressure, strain gage proven	200 TONS
Die mounting plates	24" x 26" x 5"
Die space between tie bar centers-HxV	18¼" x 18¼"
Die space clearance between tie bars-HxV	15¼" x 15¼"
Tie bar diameter	3"
Die separation stroke—adjustable to	10"

Up to 900 free cycles per hour...
500 to 700 casting cycles per hour } AUTOMATICALLY — CONTINUOUSLY

You're looking at the new KUX Model BH200—the 200-ton strain gage proven hot chamber die casting machine, which will continuously produce vast quantities of hardware finish castings with minimum maintenance and down time. Automatic operating mechanism permits a cycle with a full 10" of die movement and 6" of metal injection stroke in 4 seconds. A 6¼ lb. zinc shot can be produced in this heavy duty machine at 1800 PSI injection pressure. Sensing safeties retract the die plate and prevent recycling of machine if there is flash on the die surfaces.

Incorporated into this machine cycling mechanism is a low pressure approach of the moveable die plate, flash sensing switches, air jets for cleaning die faces, casting sweep arm, and die lubricating unit with adjustable interval timing. Also available in cold chamber models for casting aluminum with KUX "AUTO-FEED" system of vacuum die casting.

ADDITIONAL FEATURES in the 28 all-new strain gage proven KUX models are the revolutionary "VAC-U-DIE" and "AUTO-FEED" systems of vacuum die casting—motorized die height adjustment mechanism—and the patented KUX injection pressure multiplier for cold chamber models with injection pressures up to 36,000 PSI and plunger speeds up to 12,000 inches per minute.

KUX MACHINE CO. (Dept. P)
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Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

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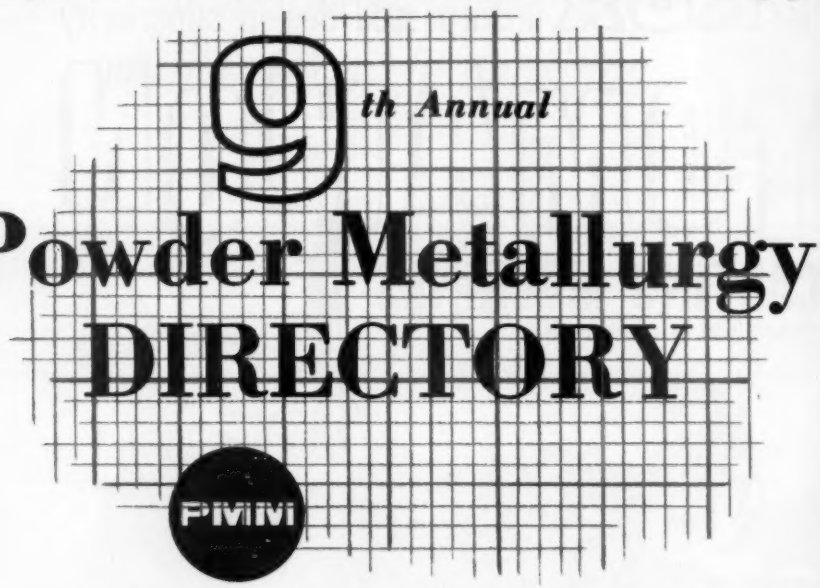
Buyer's Guide to Powder Metallurgy



in Precision Metal Molding's APRIL 1960 ISSUE

PRECISION METAL MOLDING'S April issue will be kept on hand for a full year as a reference and buyer's guide for all who design, specify, buy, produce or process parts made from metal powders.

HERE'S WHAT WILL BE INCLUDED:

1 REFERENCE DATA — How to specify sinterings to get uniform bids and the part you want.

2 PRODUCT LISTING — There will be three categories: producers of sintered parts, manufacturers of equipment, producers of metal powders. (See detailed product list at right)

3 ALPHABETICAL LISTING — All manufacturers in the powder metallurgy field will be included, together with address and list of products. ADVERTISERS GET BOLD FACE LISTINGS THROUGHOUT THE DIRECTORY.

Bonus circulation from our booth at the Metal Powder Show. Show exhibitors: Add impact to your display with a tie-in ad in this important special issue.

Is the Product Listing will be included . . .

CUSTOM FABRICATORS:
- **Bearings (All metals)**
- **Cemented carbides**
- **Contact materials**
- **Cores**
  - Ferrites
  - High frequency
  - Low frequency
- **Electrical components**
  - Collector rings
  - Commutator segments
  - Pole pieces
  - Rotor segments
- **Friction materials**
- **Magnetic materials**
  - Hard-alnico type
  - Hard-other types
  - Soft
  - Iron nickel
  - Iron silicon
  - Other types
- **Structural parts (All metals)**
- **Filters (All metals)**

EQUIPMENT SUPPLIERS:
- **Dies and tools**
- **Furnaces**
  - Electric
  - Fuel fired
- **Gas generators**
  - Anhydrous ammonia
  - Completely combusted gas
  - Partially combusted gas
  - Dissociated ammonia
  - Liquid hydrocarbon
- **Impregnation equipment**
- **Laboratory control & inspection equipment**
- **Lubricants (Die and powder)**
- **Mixers and blenders**
- **Presses**
  - Hydraulic
  - Mechanical
- **Pyrometric equipment**
- **Screening equipment**

POWDER SUPPLIERS:
- **Aluminum**
- **Brass**
- **Copper**
- **Iron**
- **Lead**
- **Nickel**
- **Nickel silver**
- **Steel**
- **Tin**
- **Zinc**
- **Others**

CLOSING DATE MARCH 1 / RESERVE SPACE NOW

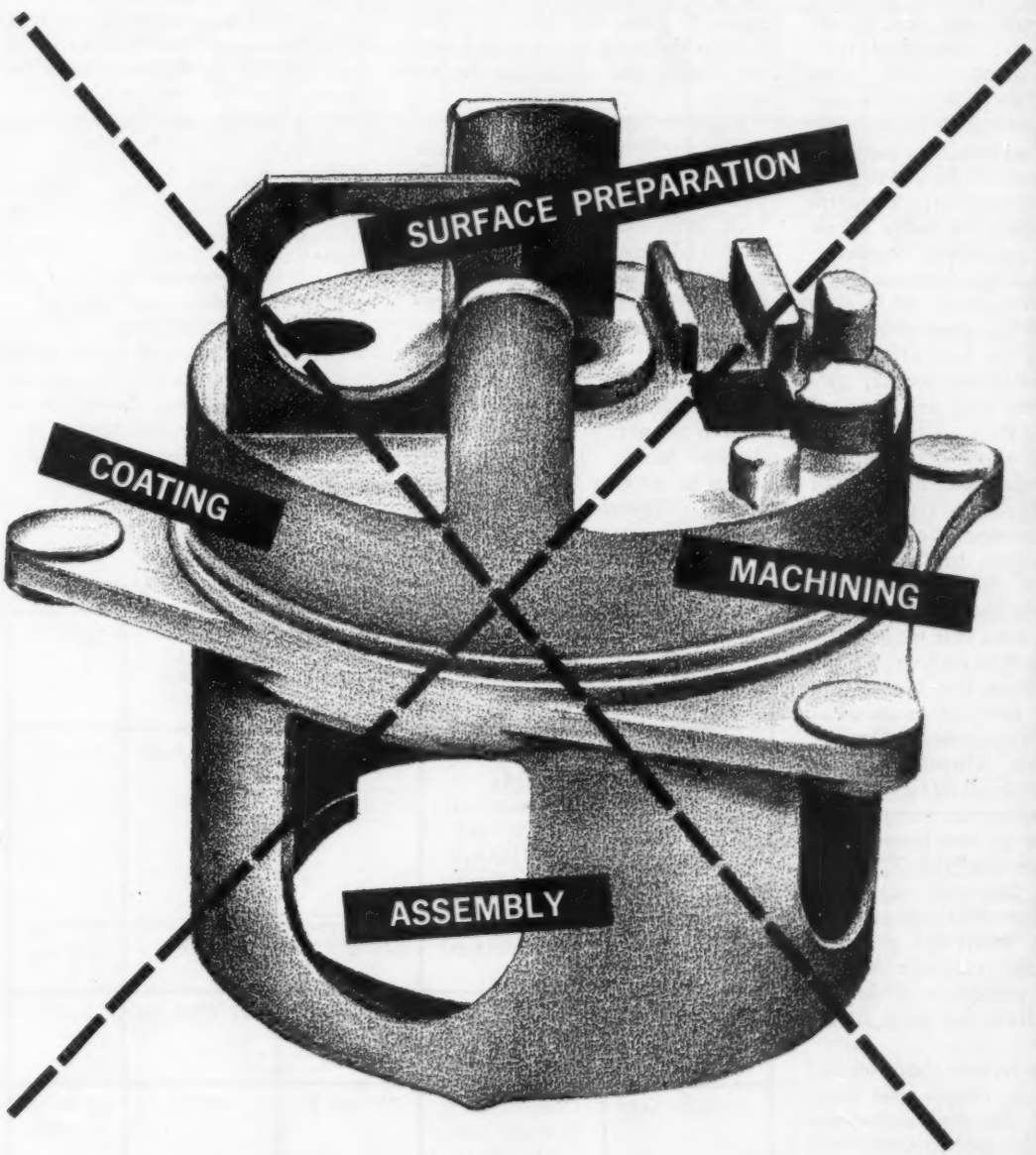
PRECISION METAL MOLDING
AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

812 HURON ROAD, CLEVELAND 15, OHIO, Superior 1-9620

SALES OFFICES: NEW YORK • CHICAGO • LOS ANGELES • LONDON, ENGLAND

FINISHING SECTION

PMM THE SPECIALIZED FINISHING METHODS, EQUIPMENT, AND MATERIALS USED TO MACHINE, ASSEMBLE, SURFACE CONDITION OR SURFACE COAT PRECISION METAL MOLDED PARTS ARE PRESENTED HERE. THIS INCLUDES ALL SECONDARY OPERATIONS WHICH CONVERT A RAW CASTING TO A FINISHED PRODUCT.



FINISHING MAGNESIUM CASTINGS

MAGNESIUM is one of the most versatile metals of commercial importance. It can be cast by sand, permanent mold, die, and investment methods; extruded into almost any shape; rolled, spun, drawn and fabricated by almost any known method. It is probably the easiest of all metals to machine.

Magnesium alloys have good stability in atmospheric exposure and resist attack by many chemicals. Other important characteristics are its high thermal and electrical conductivity, it is non-magnetic and has good absorption characteristics to vibration and shock. It is non-toxic so that special precautions need not be taken when working it.

In spite of these many advantages, magnesium castings do not find as ready an acceptance as might be expected. This is due, to a large degree, to the misconception about the high rate of corrosion of the metal.

While it is true that magnesium requires protection under many exposure conditions, this is also true of practically every other metal of commercial importance. Copper, brass, bronze, aluminum and aluminum alloys; all metals notable for their resistance to corrosion require surface protection under some exposure conditions.

There are, however, many systems for surface finishing magnesium. In fact, there are probably more successful methods of getting either a protective or decorative finish than for any other metal.

Cleaning to remove shop soil and discoloration is simple and easy. A variety of chemical conversion coatings can be applied which will give good corrosion protection or act as a base for paint or lacquer. Anodizing can be done, but generally the only coloring which should be attempted is black, other colors tend to be slightly muddy.

Electroplating is quite successful if a preliminary zincate treatment is given the castings. This is then followed by standard copper, nickel and chromium for example.

Figures 1 and 2 give brief flow charts for finishing methods suitable for magnesium die castings and magnesium sand and permanent mold castings. Some details of the different treatments are given below. More information on these treatments can be secured from the Dow Chemical Co.

PRODUCERS TREATMENT

The most commonly used conversion coating is a so-called chrome pickle. This treatment serves to protect the die castings during shipment and storage and may serve as a paint base after final machining. This treatment has a slight etching action and if it is to be used on machined surfaces an allowance of 0.0006" on surfaces and 0.0012" on diameters must be allowed.

For castings the recommended bath is:

Sodium Dichromate ..... 24 oz.
Concentrated nitric acid .. 16-24 fl. oz.
Sodium, potassium, or ammonium acid floride ..... 2 oz.
Water to make 1 gallon

The magnesium castings, after alkaline clean and rinse, are immersed in the chrome pickle bath for ½ to 2 seconds plus 5 seconds in air. The solution should be at 70° to 90°F. After standing in air the parts are rinsed, first in cold water and then in hot water.

This chrome pickle can be used

TABLE I

SOME CHARACTERISTICS OF ACID PICKLES FOR USE ON MAGNESIUM

COMMON NAME	BATH COMPOSITION[1]	OPERATING TEMPERATURE	DIMENSIONAL CHANGE – INCHES	TIME IN BATH MIN.
Chromic-nitrate-HF	Chromic Acid ($Cr0_3$) Concentrated Nitric Acid (70% $HN0_3$) Hydrofluric Acid (60% HF)	70°-90° F.	–0.0005-0.001	½ to 2
Chromic Acid	Chromic Acid ($Cr0_3$)	190°-212° F.	0.000	1 to 15
Phosphoric Acid	Syrupy Phosphoric Acid (85%) (H_3PO_4)	70°-80° F.	–0.0005-0.001	½ to 1
Sulfuric Acid	Concentrated Sulfuric Acid (H_2SO_4)	70°-90° F.	–0.002	10 to 15 seconds
Nitric-Surfuric Acid			–0.002	

[1] Water to make 1 gallon in all cases.

as a touch up treatment after machining, either immersion or brush application can be used for touch up.

SOLVENT CLEANER

Where oil, grease and other shop soil must be removed any of the standard degreasing methods can be used. These include dipping in organic solvents, vapor degreasing, and emulsion cleaning.

ALKALINE CLEANING

Alkaline cleaners of the type used for cleaning steel are most satisfactory. These will remove shop soil as well as coatings from dichromate and chrome pickle treatments. A satisfactory bath is:

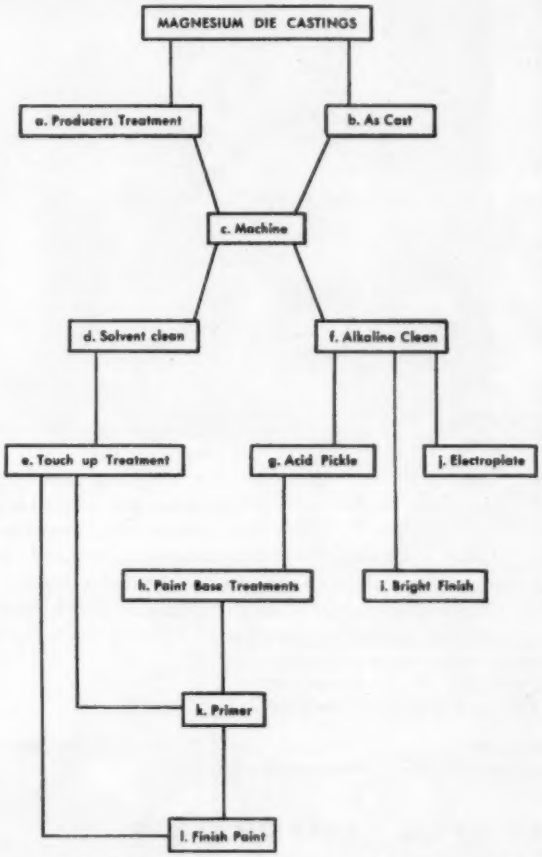
continued on page 54

TABLE II

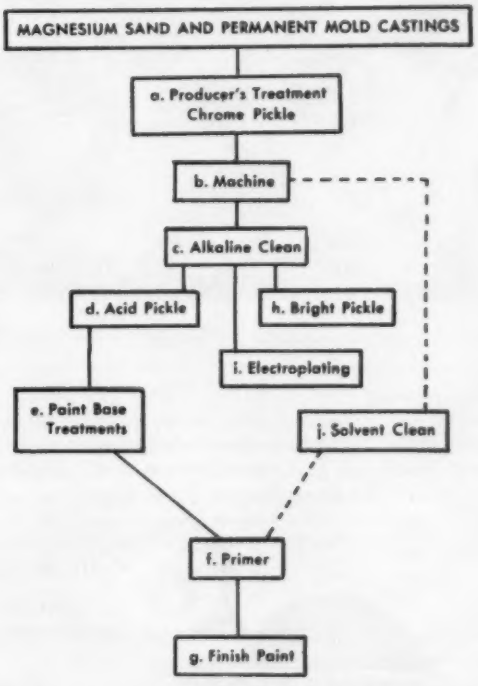
CHEMICAL TREATMENTS FOR MAGNESIUM

Dow No.	TREATMENT		SPECIFICATION[a]		alloys on which treatment may be used	Appearance	approx. no. of steps including rinses	approx. total time in treating baths minutes	Uses
	TYPE	NAME	MIL	AMS					
1	Chrome Pickle	Chemical	MIL-M-3171 Type 1	2475	all alloys	Matte gray to yellow red	5	6	general purpose treatment applied to practically all forms of magnesium for protection during shipment and storage, good paint base.
7	Dichromate	Chemical	MIL-M-3171 Type 3	2475	all alloys except EZ33A, HK31A, M1A, EK30A, EK41A,	brassy to dark brown	7	45	provides good combination of paint base and protective qualities.
9	Galvanic Anodize	Electro-Chemical	MIL-M-3171 Type 4	——	all alloys	black	7	30	used on alloys which will not take No. 7 or where a black coating is needed.
19	Chromic acid brush-on	Chemical	——	——	all alloys	brassy	1 or 2	1 to 3	protective touch-up treatment

[a] MIL-Military Specification. AMS—Aircraft Material Specifications of the S.A.E.



1—Finishing procedures for magnesium die castings



2—Finishing procedures for magnesium sand and permanent mold castings

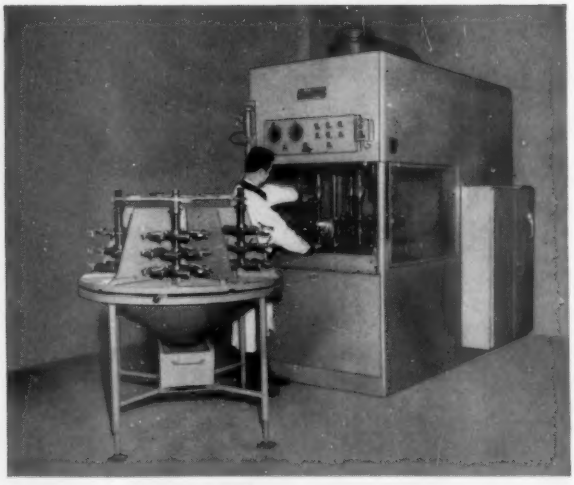
COMPARE Grav-i-Flo's Finishing Prior To Decorative Plating!

Grav-i-Flo Has Exclusive Materials To Produce Finishes Heretofore Impossible In The Tumbling Field—And On Nearly Every Shape And Size Part By These Two Processes:

TUMBLING

Grav-i-Flo exclusive barrel finishing materials make it possible to obtain finishes in a tumbling barrel that no other process can produce. Grav-i-Flo chips are the most outstanding of all barrel finishing medias on the market for decorative finishing. Many customers ultilize Grav-i-Flo's plant facilities for job tumbling of parts on which they have been unable to obtain satisfactory finishes—and then later install their own facilities.

SPIN-FINISH



Large parts, intricate shape parts not suited to tumbling and previously finished only by buffing, are now finished in production quantities to high lustre surfaces with Grav-i-Flo's Spin-Finish machines. This short, automatically timed operation offers tremendous savings in schedules, labor and floor space. No set-up time required for changing jobs. This is a completely dry process, dust and fume free, eliminating ventilating systems.

Check with Grav-i-Flo Engineering

for better finishes prior to decorative plating. Grav-i-Flo personnel were the pioneers—and are still the leaders in tumble finishing.

GRAV-I-FLO CORPORATION

Dept. PM 2 • Sturgis, Michigan

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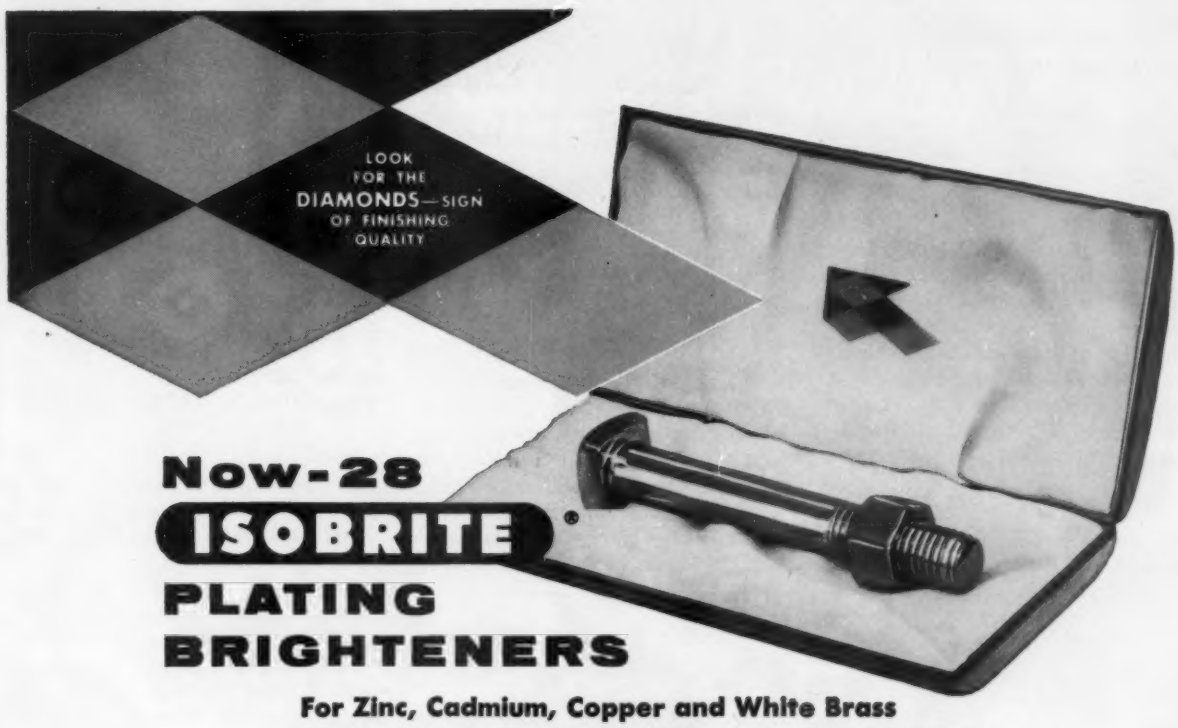


Now-28 ISOBRITE® PLATING BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass

HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

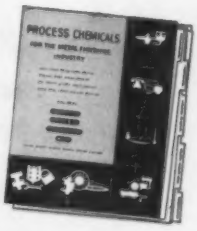
Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.



4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.

Allied Research Products, Inc.

4004-06 EAST MONUMENT ST., BALTIMORE 5, MD.
Branch Plant: 400 Midland Avenue, Detroit 3, Michigan
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromate Coatings | IRILAC® Clear Coatings | ISOBRITE® Brighteners | ARP® Plating Chemicals | WAGNER Equipment

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FINISHING MAGNESIUM

continued from page 51

Sodium carbonate .....3 oz.
Sodium Hydroxide .....2 oz.
Water .....to make one gallon
(0.1 oz. per gallon wetting agent may be added)

This bath operates at 190° to 212°F. Cleaning time varies from 3 to 10 minutes. pH of the bath should be maintained above 11. Where direct current is available the parts may be made the cathode in the bath and a current density of 10 to 40 amps. per sq. ft. used at 6 volts. All parts must be thoroughly rinsed after cleaning.

ACID PICKLE

Five different acid baths are commonly used for magnesium castings; these are shown in Table I. Note that some of the acid pickles remove up to 0.002" of metal per surface. With these baths it is advisable to machine critical surfaces after acid treatment so that parts will stay within tolerances.

(Editor's note: All information in this and subsequent reports on finishing magnesium was supplied by the Dow Chemical Co.)

PAINT BASE TREATMENT

All of these treatments are chemical conversion coatings. They serve to inhibit corrosion before painting and after painting if a failure of the paint film occurs. They also give a surface with a good "tooth" for paint bond. The most commonly used treatments are Dow Nos. 1, 7, 9, and 17. Details of these methods are given in Table II.

Hammond
AUTOMATICS
cut
GRINDING · POLISHING ·
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Your finishing problems can be solved by the proper application of Hammond Automatic or Semi-Automatic equipment. Standard heads, turrets and conveyors are used wherever possible to keep costs down. Special machines are designed for the unusual job.

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DESIGN SEMINAR

A seminar in design engineering to stimulate creative thought in design engineering and development methods and procedures will be held June 12 to 17 at The Pennsylvania State University, University Park, Pa. The course will include lectures and work shop.

NEW SALES OFFICE FOR CONSOLIDATED VACUUM

Consolidated Vacuum Corp., wholly owned subsidiary of Consolidated Electrodynamics Corp., has established regional sales and service offices in Philadelphia and Palo Alto, Calif.

William C. Cameron was named manager of the Eastern Regional Office, which will cover all states east of the Mississippi River and the Midwest. Robert O. Johnson was appointed manager of the Western Regional Office, which will be responsible for the Pacific Coast states, the Southwest, and the Rocky Mountain states.

RAMPE EXPANDS PLANT SPACE

A 100% plant expansion to keep pace with the growth of its line of precision tumbling machines has been started by Rampe Manufacturing Company on its present factory site in Cleveland, Ohio. The enlarged facilities will provide room for a three-fold production increase in the near future.

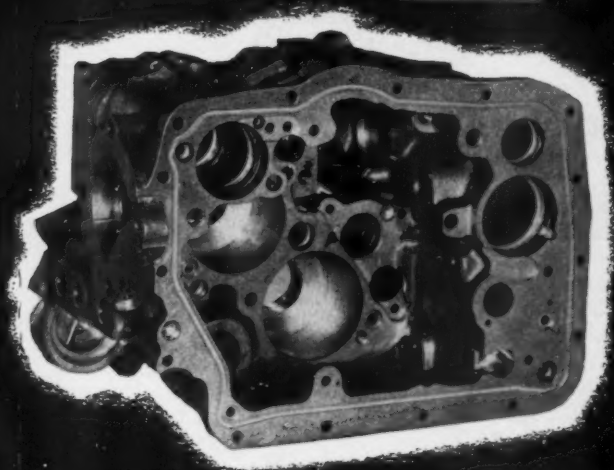
KOCH IS EXECUTIVE VP AT BASIC PRODUCTS

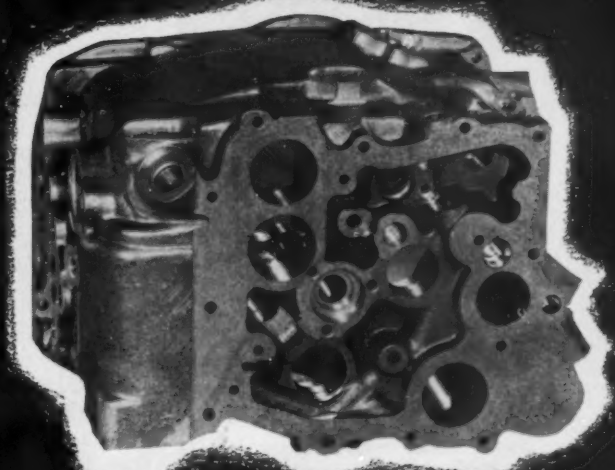
Harold E. Koch has been elected executive vice president of Basic Products Corp. Koch is president of Hevi-Duty Electric Co., which recently became a division of Basic Products, and he'll retain that presidency. He'll also supervise management of Anchor Mfg. Co. and Como-Cast Corp., new subsidiaries of Basic Products.

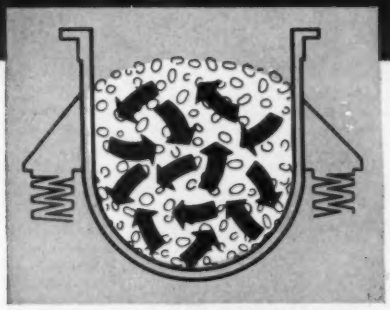
HOWARD CLOSES PLANT

HOWARD FOUNDRY CO. has closed its investment casting plant in Milwaukee because of a decline in government purchasing, especially in military jet engines. Howard operates three other foundries.

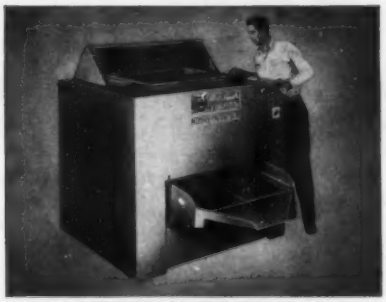
CALL ON **ROTO-FINISH RANSOHOFF** FOR *Finishing Results* LIKE THIS . . .







CONSTANT OVERALL ABRASIVE ACTION—The Vibratron work zone extends throughout the abrasive mass. Every surface is subject to constant vibrating abrasive action.



NO MORE MANUAL HANDLING of parts and media. A built-in removable separator does the job. There's no need for an extra separator.

COMPLEX ALUMINUM CASTINGS DEBURRED 2 at a time . . . in 15 minutes . . . . . the **VIBRATRON** way!

Woodward Governor Co., Rockford, Ill., long a leading manufacturer of all types of governors for prime movers, manufacture such highly precise equipment as jet engine fuel control systems. Precise finish and dimensional tolerances are a must! The fuel control shown above was previously hand deburred and then tumbled in a multiple compartment machine for 1 hour. Now . . . these cases are processed *2 at a time in 15 minutes* in the Vibratron. No hand operation is required and the finish is more uniform.

IF YOU NEED HELP ON A FINISHING PROBLEM, *Write or Phone today* **FOR FULL PARTICULARS. IT WILL PAY YOU TO GET THE FACTS ON VIBRATRON PROCESSING.**

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The Abbot asks you: What's right for your product... FINISH ...or CUT?

WHEN METAL PRODUCTS or parts need a polished, mirror-like, glass-hard *finish*, steel burnishing should be used . . . not synthetic abrasives, which have comparative application superiority only when *cutting* is what's wanted.

The high-quality steel shapes shown above on the top are products of the Abbott Ball Company, since 1909 the world's leading producer of steel finishing materials. Each different shape is designed for a special job.

SEND A SAMPLE of your product or part to us. Without charge, we'll conduct a thorough test and analysis on it, and return useful recommendations to you promptly.

Examining some samples after their test-run in the Abbott lab.

Write for copy of Bulletin AP-1

ABBOTT® the Leader since 1909 1909-1960

THE ABBOTT BALL COMPANY

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EXTRUDED GRATING

continued from page 32

except along the length of the grating.

To prevent unlocking an extruded aluminum clip is used. This clip, "D", figure 3a is furnished in precut lengths. It goes onto the joint on about 12" centers. The load limits for this grating are given in Table I.

The grating can be furnished with either a solid surface or with about ⅛ clear opening. The openings are punched in the sections after extruding.

For most applications 6063-T6 aluminum is used. The extruded sections are heat treated before punching. Where a slightly higher strength material is required 6061-T6 aluminum can be used.

The first cost of this grating is about the same as steel. It needs no maintenance so over its useful life there is a big dollar saving. Another big cost cutter is in shipping and field assembly is always done with unskilled labor and a hammer as the only tool needed.

Where cut-outs for pipes, ladders, etc. are needed they are easily made with ordinary tools.

FIRE RESISTANT FLUIDS

continued from page 45

pipe or tubing. These are potential points of leakage. Never twist a hose and when possible mount the joints vertically.

Where fluid connections must be broken frequently, use approved quick disconnect couplings.

Set up a regular program for fluid check and reclamation.

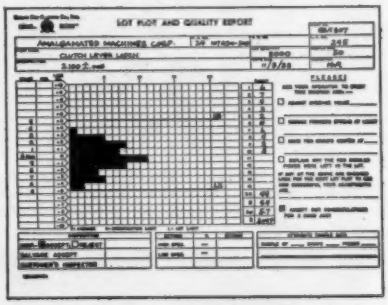
With properly selected fluid and the right maintenance program the cost of using fire resistant hydraulic fluids should come close to the cost of using petroleum oils.

On Heart Sunday February 28

GIVE® to *Fight* Heart Disease

STROH INTRODUCES STATISTICAL QUALITY CONTROL FOR DIE CASTINGS

DIMENSIONAL CONTROL AT STROH DIE CASTING BEGINS WITH A CHART LIKE THIS . . .



Here's what the new concept of Quality Control at Stroh Die Casting means to you

CRITICAL DIMENSIONS can be held within specified limits. Buyers who rely on statistical dimensioning to assure accurate parts for assembly are invited to consult Stroh.

LOWER INSPECTION COSTS come from simpler receiving inspection instead of full sampling of each shipment of die castings. Many manufacturers now benefit from Stroh's Quality Control.

Write for Details

IN OUR 56th YEAR

Stroh Die Casting Co., Inc.

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MILWAUKEE 10, WISCONSIN

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Announcing a chlorinated paint stripper which can be diluted with up to 20 parts by volume of water to form clear effective stripping solutions. Enthone Stripper S-26 will remove epoxy and other synthetic enamels at room temperature—at a make-up cost per gallon less than that of many hot paint strippers!

Stripper S-26 is an acidic, non-flammable chlorinated product, miscible with water in almost all proportions. If you now use conventional, undilutable chlorinated strippers, you can cut your paint stripper consumption at least 84% by using Stripper S-26 at a dilution ratio of 1 part stripper to 6 parts water by volume. At this dilution ratio, Stripper S-26 will readily wrinkle off modern, hard-to-strip epoxies from steel, aluminum, copper, brass and zinc die castings. Because of the large volume of water present in the made-up stripping solution, evaporation losses are much less than with undiluted cold strippers.

Get all the facts right now about economical, cold paint stripping by calling your Enthone representative for a demonstration of Stripper S-26. Or write to Enthone, Inc., 442 Elm Street, New Haven, Connecticut, for complete literature.

ASARCO

ANOTHER PRODUCT OF Enthonics RESEARCH

ENTHONE

A Subsidiary of American Smelting and Refining Company

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YOU'RE THROWING MONEY AWAY

every time you skim metal

KEEP THAT COSTLY METAL IN THE POT WHERE IT BELONGS...

P-38 FLUX

...FOR CLEANING AND REMOVING OXIDES FROM ZINC AND ZINC BASE ALLOYS.

- Brings oxides and dirt to the surface.
- Breaks dross down to a fine powder.
- Has low incidence of fuming.
- Produces high quality metal free of oil, oxides, dirt.
- Does not change alloy composition.
- Reduces metallic content of skimmings.
- No corrosive fumes that damage dies and tools.
- Is easy to use.

P-39 FLUX

... FOR LEAD, TIN, SOLDER, BABBIT, ANTIMONIAL LEAD, ANTI-FRICTION METALS

ENTHUSIASTIC USERS INCLUDE: • **Convair Astronautics** • **Rohr Aircraft Corp.** • **Morris P. Kirk & Sons** • **Kwikset Locks** • **Peat Mfg. Corp.** • **Union Die Casting Co.** • **Fan-Arc Mfg. Co.** • **Ryan Aircraft Mfg. Corp.**

FREE SAMPLES **are yours by requesting on company letterhead. Give size of melting pot and type of metal used in each heat.**

P-38 BRINGS CASH SAVINGS OF $7,389.00

A prominent die caster used to sell 4,500 lbs of skimmings each month to a local smelter. The cash loss of this metal, (cost of original ingot, minus the price paid for the waste), yearly amounted to $8,910.00. In addition, he used a competitive flux that cost $1,680 yearly. Total annual loss of metal and flux was $10,590.00.

By switching to P-38 Flux, this die caster was able to extract better than 90% of the metal from the skimmings. The resulting metal savings brought about a yearly net cash savings of $7,389.00

OTHER PRODUCTS: **Fluxes and degassers for aluminum, bronze, and brass.**

ASSOCIATED
FOUNDRY SERVICES, INC.
7600 S. AVALON BLVD. • LOS ANGELES, CALIF.

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USEFUL LITERATURE *continued from page 24*

180 **Dry Phosphatizing** — E. I. DUPONT DE NEMOURS & CO. — Technical data on a "dry" phosphatizing process that eliminates water solutions and applies protective phosphate coatings to zinc, aluminum, magnesium, steel.

181 **Barrel Finishing** — MINNESOTA MINING & MFG. CO. — 12-page technical barrel finishing manual tells how to make a trial run, select abrasive media and compounds. Gives other pertinent data.

182 **Steel Abrasive** — WHEELABRATOR CORP. — Technical bulletin gives performance and statistical data on steel abrasive for blast cleaning.

183 **Metal Processing Equipment** — PENNSALT CHEMICALS CORP. — 15-page booklet describes a complete line of machines and services for metal processing.

184 **Derusting Process** — ENTHONE, INC. — Technical data on the Endox process, a alkaline method for derusting and descaling steel.

185 **Electrical Discharge Machining** — ALLIED PACIFIC MFG. CO. — Data folder on this process for making die cast cavities, powder metal dies, extrusion dies.

186 **Clamps, Fixtures** — CONFORMING MATRIX CORP. — Brochure describes mechanical and air-operating clamps for holding masks and parts.

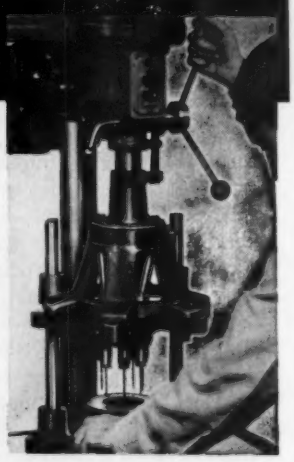
187 **Abrasive Finishing of Copper** — LEA MFG. CO. — Data sheet gives procedures for abrasive finishing of castings and extrusions.

ETTCO-EMRICK

Knuckle-heads

fully adjustable for dependable multi-hole drilling and tapping

5 models to choose from — circle or straight line types



- Chrome nickel universal ball joint type spindles.
- Adapt to any drill press or drilling or tapping unit or machine — Operate in any position.
- Quickly convertible for either drilling or tapping on any drill press.
- Lubricated ball joints with neoprene covers — an Ettco exclusive.
- Tap or drill capacities up to ⅝" in steel.
- Precision built, lightweight and compact.
- Unconditionally guaranteed for workmanship, material and performance.

Write for complete details today . . .
Buy them from your Ettco Distributor

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AND MARKETABILITY...

Build Your Product With

ZINC DIE CASTINGS

Out of the myriad materials available, this manufacturer used zinc die castings in their wall can opener because they:
The Rival Manufacturing Co.'s, "Can-O-Mat" and its four components die cast in zinc at right.

These advantages enabled the manufacturer to market the opener successfully in a highly competitive field where style, flawless finish and moderate cost are prime requisites.

Industry's preference for zinc as a base for die castings is indicated by the fact that, normally, zinc alloys account for about two-thirds by weight of all die castings used annually. This is due to ease of casting and finishing, excellent physical properties, close dimensional tolerances and the wide variety of beautiful finishes which can only be attained with die castings based on 99.99+% zinc.

Die Casting is the Process...Zinc the Metal...

BUNKER HILL 99.99+% ZINC

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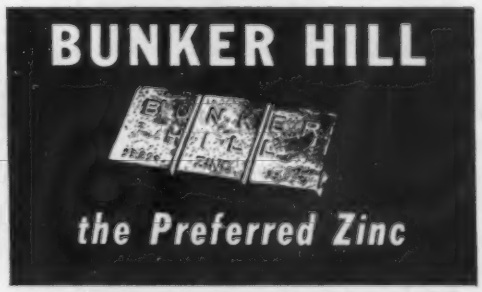
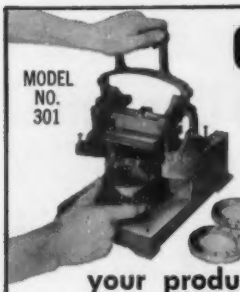
SALES OFFICE FOR PACIFIC COAST
THE BUNKER HILL CO., 660 MARKET ST., SAN FRANCISCO, CALIF.

ZN-147





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your products, parts, caps, containers, etc. with the—

ACROPRINTER®

Tedious hand filling, messy spraying and sloppy applications of color . . . are eliminated when you use the ACROPRINTER®.
We make a flexible die of ACROPRENE® to exactly match the cavity, depression and contour of your part or product, then set it in the ACROPRINTER® No. 301 or No. 401A . . . making your color filling operation a high production mechanical one that applies printing ink or enamel precisely and attractively.
Die-Cast, stamped, embossed, molded, cast and engraved parts are accurately color filled with lettering and design.

Model No. 301 is a hand operated machine adjustable for utmost perfection. Model No. 401A is the air-operated machine with that same precise touch and higher speed.

For FILLING or PRINTING, send a sketch, sample part or description with dimensions. Acromark Engineers will give you the full answer promptly, with illustrating data.

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AIR OPERATED

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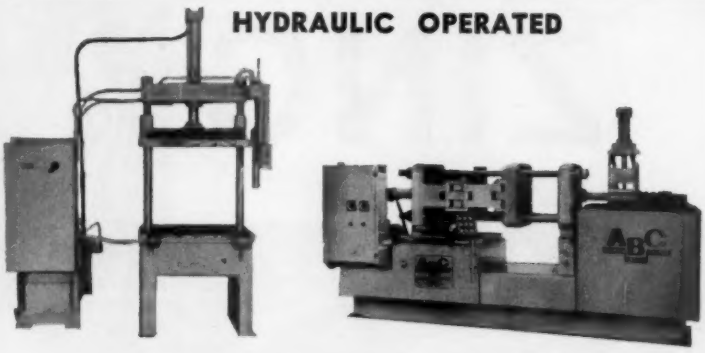

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ABC DIE CASTING MACHINE COMPANY

400 East 142nd Street Dolton, Illinois

4th in a series of POWDERED METAL PARTS applications by REESE

when **SERVICE** and **KNOW-HOW** count as much as **ECONOMY**

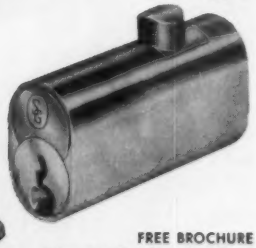
3 Remet Powdered Metal Parts go into Sargent & Greenleaf

FILE CABINET LOCKS

(A) PLUG
(B) FILLER
(C) BOLT

Formerly a zinc base die casting . . . now sintered brass for a higher melting point for use on insulated files.

According to Mr. George Paul, Chief Engineer, Sargent & Greenleaf, Inc., "A number of powdered metal parts producers were contacted to make these low cost, close tolerance, complex parts. Reese was the only one interested. We now find other practical applications and will, of course, use Reese as our prime source".



FREE BROCHURE

"How to Cut Precision Parts Cost with the Remet Powdered Metal Process" shows how the Reese Corp. can help you. Send for your copy today.

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REESE METAL PRODUCTS CORPORATION

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Gears • Pinions • Cams • Ratchets
Oilless Bearings • Bushings • Machine and Structural Parts in
COPPER • BRASS • IRON • ALLOY STEEL • NICKEL SILVER • COPPER INFILTRATED IRON

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NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

CRAWFORD IN NEW ICI POST

C. A. CRAWFORD

Concurrent with the formation of a new technical group within the Investment Casting Institute, J. H. Morison, president, has announced the appointment of C. A. Crawford as Technical Director.

According to Crawford the ICI plans for technical activities in 1960 include the formation of technical study groups in specific areas of investment casting technology; a program of reviewing and abstracting pertinent literature and the development of better liaison with government and private research facilities.

SMITH HEADS ALUMINUM EXTRUDERS

MILTON J. SMITH

Milton J. Smith, president of Trim Alloys, Inc., has been elected president and chairman of the board of the Aluminum Extruders Council. The AEC is composed of the non-integrated extruders of aluminum, their production is largely in the so-called soft alloys. About 130 firms are active in aluminum extrusion, many of them members of the Extruders Council.

ARWOOD EXPANDS, NEW PRESIDENT ELECTED

Merger of two wholly owned subsidiaries of the Mercast Corp., Mercast Mfg. and Alloy Precision Castings with Arwood Precision Casting Corp. has been announced. The new company will operate as the Arwood Corp.

With the merger, Arwood will have plants in California, Connecticut, New Hampshire, New York and Ohio. Assets of the corporation will be over $4.5 million. Last year sales of precision castings were approximately $10 million.

At the time of the merger, Rawson L. Wood was elected chairman of the board; William I. Matthes president; and William O. Sweeney executive vice president.

KREPLEY NEW MANAGER FOR ALUMINUM EXTRUSIONS

JOSEPH F. KREPLEY

The Metals Div. of Olin Mathieson Chemical Corp. has announced the promotion of Joseph F. Krepley to extrusion product manager. At the same time, Richard E. Clay was named transportation sales manager.

Krepley has been with Olin since 1957. Prior to that, he was a project engineer for the Aluminum Company of America. Clay was formerly manager of automotive sales for Olin. He will retain that position and in addition has been assigned marketing duties involved with the entire transportation market.

NATIONAL-U.S. RADIATOR SOLD

The operating assets and name of National-U.S. Radiator have been sold to the Crane Co. according to an announcement from both companies. Purchase price for the plant equipment and inventory is reported as $15 million. The agreement has been approved by the board of directors of both companies and actual transfer will be on February 1, after approval by stockholders of National-U.S. in January.

AZI RESEARCH PROGRAM DOUBLED IN 1960

The zinc industry will increase its research and promotional efforts very substantially during 1960. This is a continuation and expansion of efforts underway for a number of years and the recently accelerated AZI Expanded Research Program.

Approval to continue research at an increased rate of expenditure was given unanimously at a recent meeting of AZI's Board of Directors, a report from John L. Kimberley, executive vice president, said. The institute's budgets for research and promotion have about doubled in the past two years, according to the report. Dr. Schrade F. Radtke, appointed research director in September 1958 will continue to administer the expanded research activities.

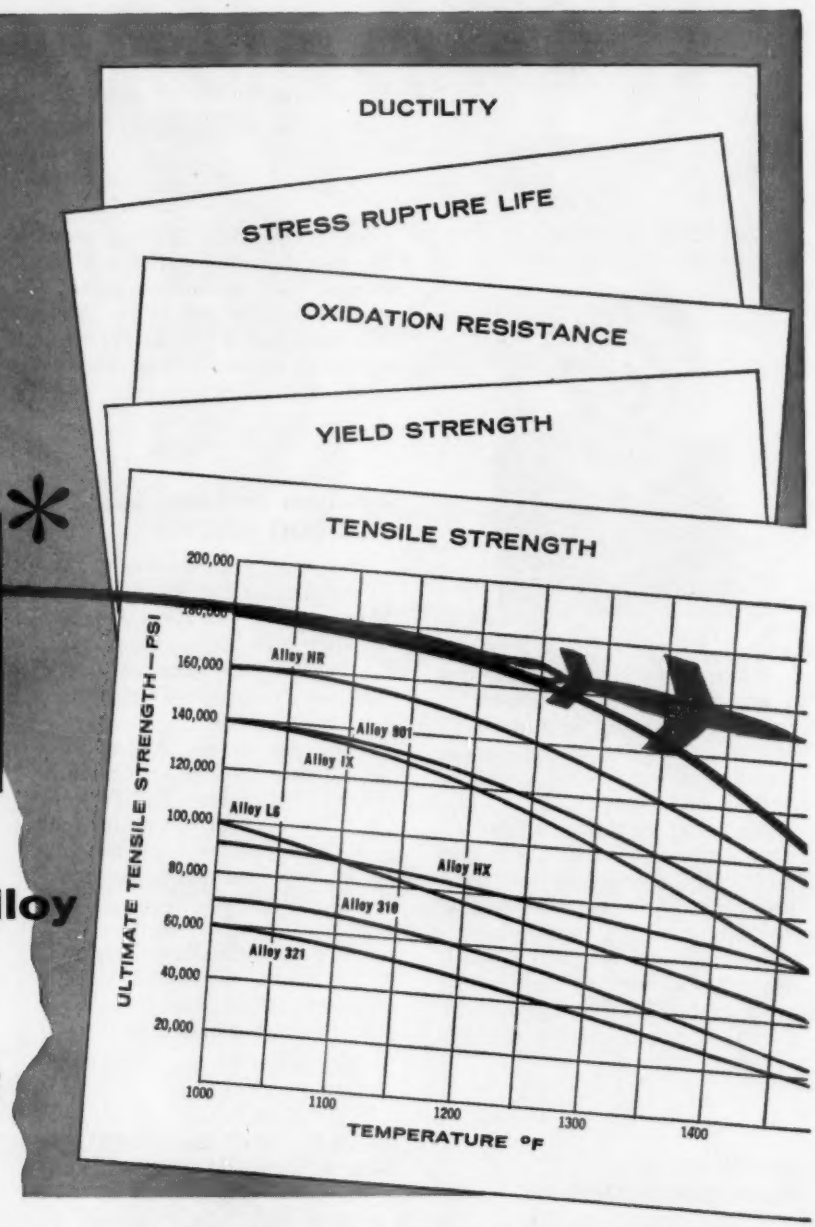
continued on page 64

HIGH

on every chart:

RENÉ 41*

most dependable alloy in use today in the 1200°-1800°F range



In *all* ways, René 41 is a remarkable alloy. No other high-temperature alloy used in production today equals its tensile strength. In other properties, too, René 41 is far ahead of the field.

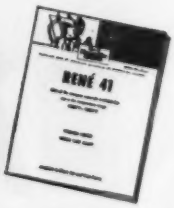
Also important, this nickel-base, vacuum-melted alloy is easy to work with. It's readily formable by drawing, bending, spinning — welds to similar or dissimilar materials.

Cannon-Muskegon offers René 41 in standard 36"x 96" sheets .015" to .125" thick, in smaller sizes down to .010", in bar stock up to 3" in diameter . . . foil down to .001 in thickness . . . and fine wire only .0015 in diameter.

For complete details, write for Technical bulletin No. 86.

*TM of General Electric Co.

ULTRAMET
VACUUM ALLOYS



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METALLURGICAL SPECIALISTS

L-59

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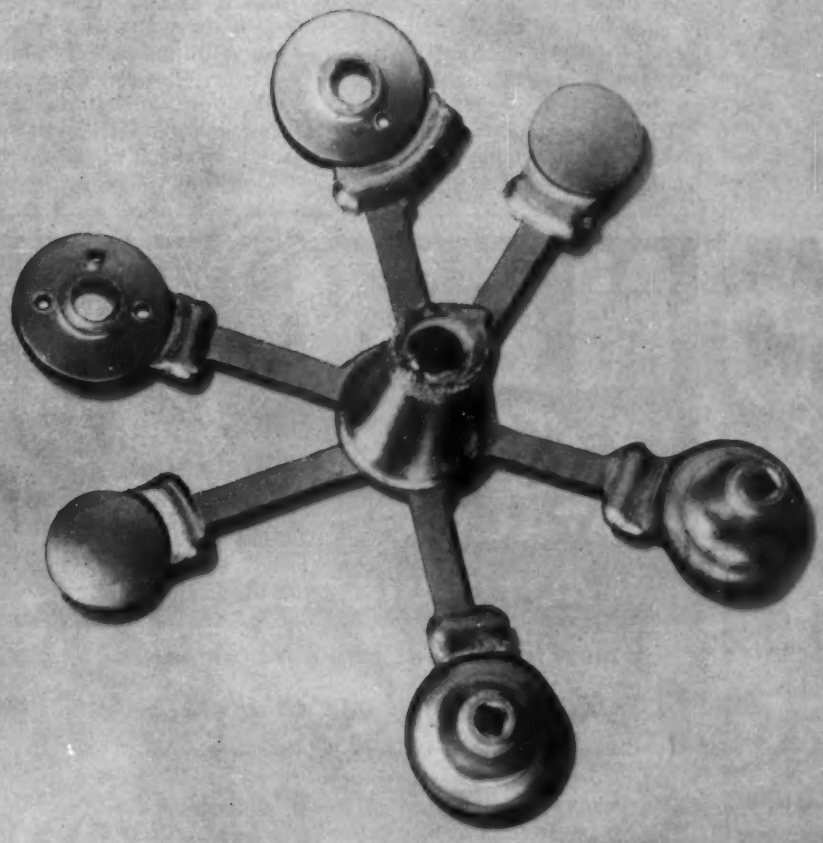
Your surest start for fine die casting: Federated-Asarco Di-Metal is made from special high grade zinc, electrolytically refined by Asarco-developed processes. Production is now concentrated "under one roof" at Corpus Christi, Texas, one of the world's largest high grade zinc producing plants. Integrated production—controlled from mine to finished alloy—assures you of lower cost materials, and the highest purity and uniformity of zinc Di-Metal. Federated can serve your needs through 22 sales offices. There's one near you. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd.—Toronto and Montreal.

FEDERATED METALS DIVISION OF



ASARCO

AMERICAN SMELTING AND REFINING COMPANY

NEW COPPER ASSOCIATION FORMED

Formation of Copper Products Development Association, Inc., was made public today. Six major copper producers are charter members of the organization formed to conduct research and studies "for expansion of uses of copper and copper products, and the development of new and improved copper products."

Member companies are: American Metal Climax, Inc.; American Smelting & Refining Company; The Anaconda Company; The International Nickel Company of Canada, Limited; Kennecott Copper Corporation; and Phelps Dodge Corporation. Any producer of copper is eligible for membership, and participation by other copper companies will be invited shortly.

Dr. Clyde Williams, for many years the key leader in and recently president of the Battelle Memorial Institute of Columbus, Ohio, has been named technical director pro tem.

The new organization does not presently intend to provide its own facilities for investigations, but will allocate research assignments to individuals, universities, and established research organizations.

The initial board of directors consists of two members of each of the charter companies, as follows: American Metal Climax, Inc., Arthur H. Bunker, Jean Vuillequez; American Smelting & Refining Company, J. D. MacKenzie, Simon D. Strauss; The Anaconda Company, Clyde E. Weed, John A. Coe; The International Nickel Company of Canada, Limited, Henry S. Wingate, O. B. J. Fraser; Kennecott Copper Corporation, Charles R. Cox, Glenn P. Bakken; Phelps Dodge Corporation, Robert G. Page, John J. Conlon.

The officers of the association will be elected by the board of directors at its first meeting.

DUNN MANAGER OF ALCOA LABORATORY

J. Howard Dunn has been named manager of Aluminum Company of America's process development laboratories at New Kensington, Pa. Mr. Dunn formerly was manager of Alcoa's Cleveland sales development division.

MERRIMAN

"KNOW-HOW" can solve your Powdered Metal Problems

and cut your costs!

The highly experienced Merriman design and engineering staffs are always available for consultation on any problem. Our skilled craftsmen transform their designs into highest quality parts which are dimensionally perfect in every respect.

WRITE FOR CATALOG AND TECHNICAL BULLETIN.

POWDERED METAL DIVISION
MERRIMAN BROS., INC.
ORIGINATORS OF SINTERED HELICAL GEARS
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REPRESENTATIVES IN PRINCIPAL CITIES
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NEW PISTON RING CATALOG BY AUTO-DIESEL

A must for all Die Casting Machine Users:

Highlighting this new catalog are:

- Dieloy Cast Iron plunger rings for Hot Chamber Machines
- Hardened Stainless Steel plunger rings
- "NIHARD STEEL RINGS" for Hot Chamber Machines
- NIHARD STEEL PLUNGER RINGS for tips on Cold Chamber Machines
- Tips & shot well sleeves are also manufactured for the die casting machines

Catalog on Request

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

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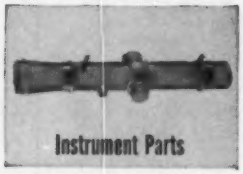
For your zinc or aluminum


Instrument Parts

Small Engine Cylinders

DIE CASTINGS CHOOSE ADVANCE

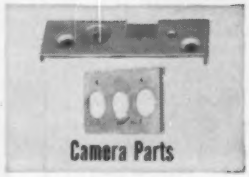
because . . .

above and beyond the measurable factors of metallurgical control and mechanical equipment (which others may also possess to a degree) there are at ADVANCE creative engineering, in-plant tool making, production skill and management attitudes toward customer requirements not always encountered in run-of-the-mill markets.

ADVANCE supplies zinc and aluminum components to fine product makers from Texas to Massachusetts as well as to its good neighbors in the Mid-west. Geographical distance is no barrier to quality production.

So . . . check with ADVANCE for your zinc or aluminum die casting requirements.

Motor Housings


Camera Parts

Control Valve Components

Valve Cases

These symbols are your assurance of highest quality control of zinc and aluminum alloys under ADCI standards

ADVANCE TOOL AND DIE CASTING CO.

38 years of service to industry

3782 N. Holton St.
Milwaukee 12, Wis.

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DIE MAKERS — DIE CASTERS

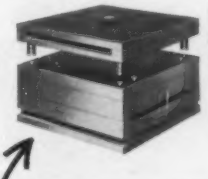
Standardize with D-M-E and Save!

Reduce design time and cut die construction costs with these D-M-E STANDARDS—combined to fit your needs!

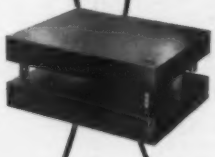
For added savings, start with D-M-E Standards—they're "better to begin with" because they're made of the finest steel, finish-ground flat and square. Only D-M-E Standards give you "custom-made" construction with the cost-saving benefits of standardized, interchangeable components.

RACK and PINION EJECTION

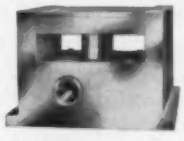
HYDRAULIC EJECTION



D-M-E Standard Cavity Retainer Sets

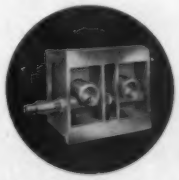


From 9⅞" x 8" to 23¾" x 35½"



D-M-E Standard EJECTOR BOXES up to 18" x 35½"

D-M-E Standard EJECTOR HOUSINGS up to 23¾" x 35½"



Welded Steel Construction (Patented)—30% lighter than cast-iron boxes!

Write for 170 page D-M-E Catalog, listing complete data and prices—or call or write your nearest D-M-E Branch TODAY for additional information.

58-E

DME DETROIT MOLD ENGINEERING CO.

Contact Your nearest Branch for Faster Deliveries!

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Lepel
HIGH FREQUENCY
INDUCTION
HEATING
UNITS
BRAZING
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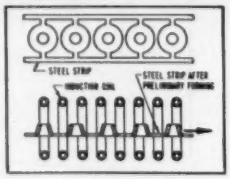
ANNEALING
Lepel induction heating equipment represents the most advanced thought in the field of electronics . . . the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations

TYPICAL INDUCTION HEATING APPLICATIONS

PLASTIC COATING OF TOOL HANDLES

A production line operation for coating handles of tools at Whitney Metal Tool Co., Rockford, Ill. uses induction heating with excellent results. The handles only are heated by induction to the desired temperature then dipped into a vinyl chloride base coating material for a short period depending upon the thickness of coating desired. The plastic coating formed on the handles is then cured by immersion in a carbo-wax bath.

FORMING OF METAL STRIP FACILITATED BY PROGRESSIVE ANNEALING



Metal forming operations which require intermediate anneals to restore ductility can be facilitated by induction annealing the strip progressively. Diagram illustrates this procedure for partially formed thin austenitic stainless steel strip. The induction annealing operation is scheduled in the production line between two press operations. Metal strip and wire of other materials are also induction annealed in this manner.

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.
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All Lepel equipment is certified to comply with the requirements of the F.C.C.
LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, N. Y.

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SYMPOSIUM ON REFRACTORY METALS AND ALLOYS

A two-day symposium on "Refractory Materials and Alloys" will be held May 25-26, 1960, at the McGregor Center, Wayne State University, Detroit, under the sponsorship of The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

RANSOM & RANDOLPH OFFICER DIES

Thomas E. Moore

Thomas E. Moore, and officer of Ransom & Randolph Co. died Jan. 16, 1960. At the time of his death, Moore and his wife were living at Ormond Beach, Florida. Moore was research director for the company for many years. Later he became Industrial Div. manager and for the past 15 years a member of the board of directors. He was an authority on investment casting for both dental and industrial uses. At the time of his death, Moore was 70 years old.

WORLD POWDER METALLURGISTS TO MEET IN 1960

The technical program for 1960 International Powder Metallurgy Conference which will take place in New York City, Hotel Biltmore, on June 13-14-15 has just been released.

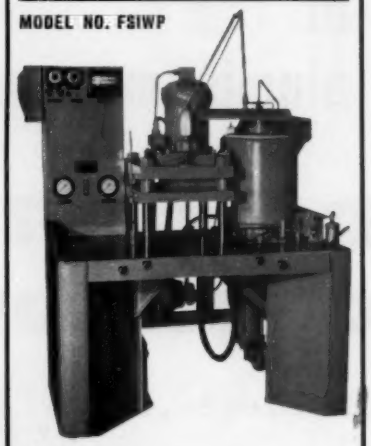
The International Conference, first to be held in this country, is sponsored by the Metal Powder Industries Federation, the American Institute of Mining, Metallurgical and Petroleum Engineers, Powder Metallurgy Committee.

continued on page 69

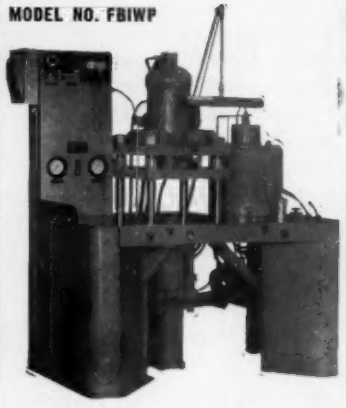
NEW

3½ lbs. WAX CAPACITY ON STANDARD MODEL #FSIWP

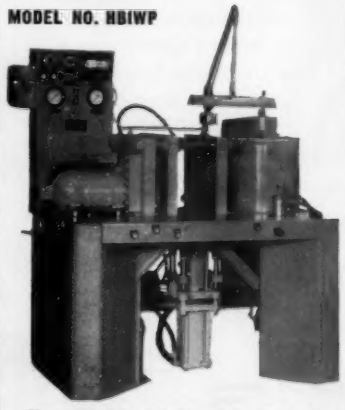
MODEL NO. FSIWP



MODEL NO. FBIWP



MODEL NO. HBIWP



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Any Type or Size Unit Built to Your Specifications.

LEYDEN HYDRAULICS, INC.

1800 North River Rd. • Melrose Park, Ill.

MT. VERNON DIE CASTINGS help STANLEY develop stronger, lighter, tougher heavy-duty builders' saws

CASE HISTORIES FROM MT. VERNON FILES

Stanley packs more power into its new line of low-cost, heavy-duty saws . . . and saves important weight doing it! They have been designed for greater utility, with such features as: Ball bearing guard — fingertip depth-or-bevel setting, uncluttered front — window brush-holder for simpler servicing, extra handling comfort, positive control, etc. Yet, with all these improvements, Stanley is still able to sell these better saws for less!

A big reason for this lower cost is Mt. Vernon's coordinated four-fold die casting service: designing, die-making, casting and machining. Mt. Vernon worked closely with Stanley* to create light, thin-walled aluminum castings with strength to spare. All parts are produced with excellent surface finish to facilitate barrel burnishing. Many fit together without machining thereby contributing to lower manufacturing and assembly costs.

Stanley is typical of the leading manufacturers in the power tool industry who know and rely on Mt. Vernon's experience and facilities for die cast zinc and aluminum parts. As the largest independent die casting company — with over 200,000 square feet under one roof — our services and equipment are ready to help solve your design and production problems. We'll be glad to discuss the advantages of die castings with you at any time. Just call your nearest Mt. Vernon sales representative.

*Stanley Electric Tools, New Britain, Conn.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT

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BROOKLYN, N. Y.: Mr. Robert V. Moore, 2317 Plumb 2nd St.
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GUILDERLAND, N. Y.: Mr. David H. King, 75 Willow St.
LUTHERVILLE, MD.: Mr. C. McIntosh Gordon, Box 55, R.R. No. 1
PITTSBURGH, PA.: Mr. Andrew W. Anderson, 300 Pasadena Drive So.
QUINCY, MASS.: Mr. Edmund W. Libby, 91 Merrymount Rd.
ROCHESTER, N. Y.: Mr. William Sauers, 101 Briarcliff Rd.
SKANEATELES, N. Y.: Mr. Jerome J. Theobald, 9 E. Genesee St.
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POSITIONS WANTED

STATE OF FLORIDA—Experienced Manufacturers' Representative-graduate engineer desires an additional account for the state of Florida. Presently contacting industrial firms and the building and construction fields. Must be well established firm. Box 2160.

CASTING SALES ENGINEER — Progressive salesman — 15 years experience selling and servicing non-ferrous castings. Sand, permanent mold, diecasting. Familiar with all casting processes. Resume upon request. Box 2260.

POSITIONS OPEN

TECHNICAL ASSISTANT in process department with investment casting experience. Casting Engineers, Inc., 2323 North Bosworth Avenue, Chicago 14, Illinois.

DIE CASTING — DIE DESIGNER

The Western Electric Company, Manufacturing and Supply Unit of the Bell Telephone System, has immediate opening in Baltimore, Md., for design engineer experienced in the design of aluminum die casting dies. Experience in injection mold design and tool and die design desirable. This is an excellent opportunity in a progressive company. A personal interview in Baltimore (expenses paid) will be arranged for qualified candidate. Liberal relocation allowance will be granted if employed. For prompt reply, send resume giving age and brief outline of education and experience to: Employment Manager, Western Electric Company, 2500 Broening Highway, Baltimore 24, Maryland.

EQUIPMENT WANTED

EQUIPMENT WANTED—Used die casting dies for any proprietary items to be made and sold only in Colombia, S. A. We are particularly interested in cap pistols and other toy dies, furniture and household hardware and any large volume item which could have sale in a slowly developing country. Amering Corp., 11 Market St., Stamford, Conn., New York Telephone, Tivoli 1-8811.

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding. 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

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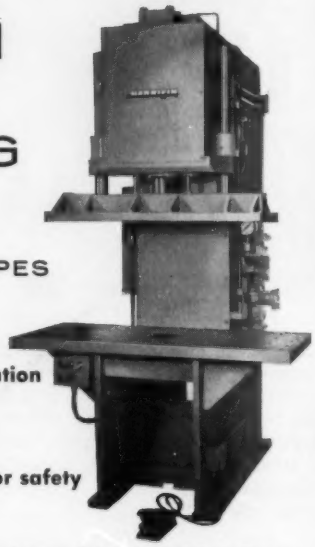

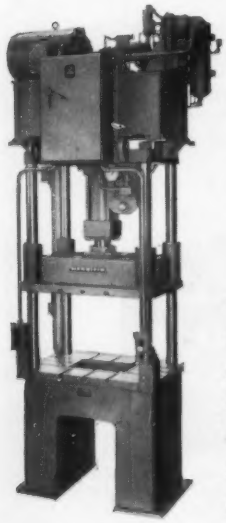

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CLEVELAND AUTOMATIC MACHINE CO. APPOINTS DISTRICT MANAGER

The Cleveland Automatic Machine Company announced the appointment of Edward W. Raineault as District Manager of the Eastern territory, including the six New England states and Eastern New York State. His headquarters will be in Hartford, Conn.

Mr. Raineault has been with the company over five years, handling service from the Hartford office. He succeeds former District Manager Russell A. Hanna, recently deceased.

WAINDLE NAMED TO I.C.I. POST

Roger E. Waindle, president of WaiMet Alloys Co. has been named by the Investment Casting Institute to the newly created position of Vice-President — Technical Division.

In his new position, Waindle will direct activitiy of I.C.I's technical programs, which include the development of standards for investment casting practices and alloys. Waindle, formerly president of the American Society of Tool Engineers, is also active in many other technical groups in the fields of production and metallurgy.

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INDUSTRY NEWS

continued from page 66

Conference Chairmen are Kempton H. Roll, Executive Secretary of the Metal Powder Industries Federation and Fritz V. Lenel, Prof. of Metallurgy, Rensselaer Polytechnic Institute. Program Chairman is Claus G. Goetzel, Senior Research Scientist and Adjunct Professor, Department of Metallurgy, New York University.

Copies of the full program may be obtained from Kempton H. Roll at Metal Powder Industries Federation, 60 East 42nd Street, New York 17, N. Y.

NEW OFFICERS OF THE SOCIETY OF DIE CASTING ENGINEERS, INC.

New national officers for the Society of Die Casting Engineers, Inc. are: Ollie J. Clayton, President, Efficient Tool & Die Co., Cleveland, Ohio; James L. Sutton, Vice President, Dura Corporation, Toledo, Ohio; Mayer T. Tenenbaum, Secretary-Treasurer, Lester-Phoenix, Inc., Detroit, Michigan; Glen L. Boxell, Director, Delco Radio Division GMC, Kokomo, Indiana; Joseph R. Elkins, Director, J. R. Elkins, Inc., Brooklyn, New York; Clarence Tice, Director, Delco Remy Division: GMC, Anderson, Indiana; John B. Fischer, Director, Chrysler Casting Plant, Kokomo, Indiana; John T. Weston, Director, Grand Rapids Die Casting Co., Grand Rapids, Michigan; Herman J. Windolph, Director, Holland Die Casting Co., Holland, Michigan.

The Society of Die Casting Engineers directs its efforts toward the integration and development of the die casting industry through the education and dissemination of the knowledge of die casting and its allied arts.

SEL-REX CORPORATION BUYS THE MEAKER COMPANY

The Meaker Company, Chicago, Illinois, manufacturer of automatic systems for continuous and batch metal processing or finishing, has been purchased by Sel-Rex Corporation. According to Morris M. Messing, President of Sel-Rex, The Meaker Company will operate as a wholly-owned subsidiary, under the supervision of its present staff.

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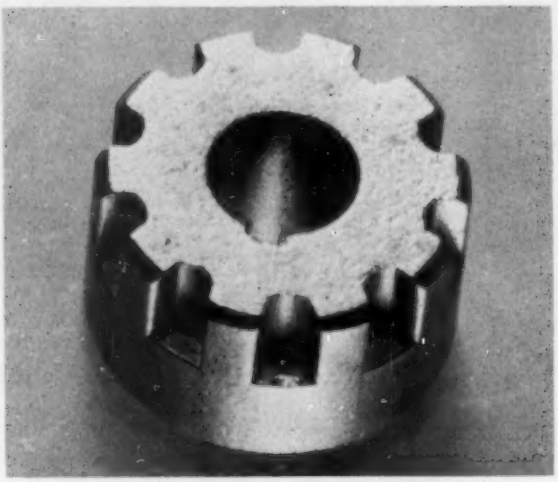
DESIGN FOR THE PMM PROCESSES

18 TO 1 STOCK REDUCTION



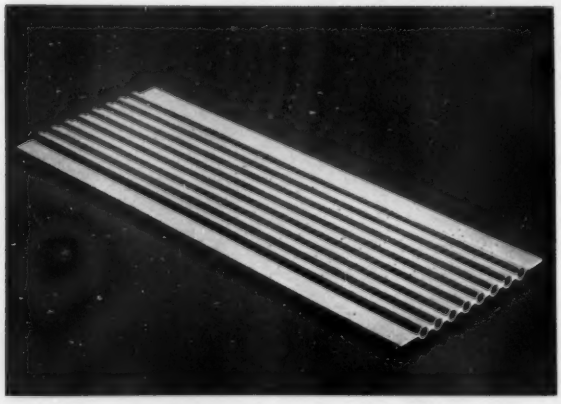
IF YOU MACHINED a lot of parts with a common shape, but in 18 different sizes, you'd either stock 18 different sizes of bar stock or waste a lot of expensive material making big bars small. UNLESS you changed to sinterings. That's what the company who used steel hubs like the one shown did.

The part is a drive hub on fractional horse-power A-C motors. Not only were there 18 different sizes, but for each size there might be several different bores for the different shaft sizes.

The problem was taken to Eaton Mfg. Co., Powdered Metals Div. For them the raw material stocking was a simple one since all different sizes used the same basic powders. Then the flexibility of the powder metallurgy process gave a second advantage. The hub could be redesigned with the splines blind instead of open at both ends. This strengthened the hub.

Finally the pay-off. The cost reduction by using sinterings was great enough so that the tooling costs of over $6000.00 were paid for by the first 1000 pieces of each size.

SPECIAL ALLOY, TIGHT TOLERANCES, STILL ECONOMICALLY PRODUCED



EXTRUSION IS, SOMETIMES, the only way to make a product. For example, the tube and fin assembly shown in the illustration. A special alloy, designated by the extruder as M-388, had to be used. The assembly is 4.762″ wide and the tubes have an OD of 0.314″. Further, the diameter of the circle tangent to the tops of the ribs is 0.2425″ and must be held to tolerances of 0.0025.

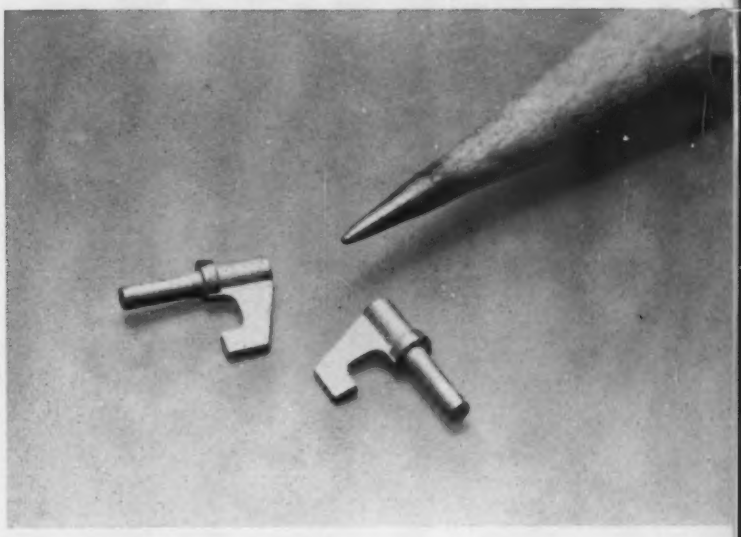
The tolerances on the entire job precluded a brazed assembly. Because lengths of 36″ were required, a machined part could not be used.

Yet tooling, in spite of the complexity and close tolerances was under $800.00 and when necessary short runs of as little as 25 or 50 pounds could be made.

The tube plate is used in nuclear reactor work as fuel and blanket plates.

The part is made by PRECISION EXTRUSIONS, INC.

LITTLE CASTING DOES TOUGH JOB



THIN SECTIONS, close tolerances, small size, durability, and low cost are all featured in this tiny investment casting produced by Casting Engineers, Inc.

One of the smallest parts ever made by the Minicast process, it's a deflector chad, which is part of a perforating accessory for a teletype machine. It is less than .2 in. long, has a flag portion .045 in. thick, and its critical dimensions are held within a tolerance of .002.

The chad formerly was produced in low-carbon steel as a stamping which had to be machined and coined.

Now, as an investment casting, it is used as-cast, at cost savings of more than 62 percent. Because toughness and abrasion resistance are needed for its high-speed, repetitive operation, it is cast in silicon-manganese tool steel.

Nearly a million of these parts already have been produced.

Here's a way to . . .
A BETTER PRODUCT AT LOWER COST

RESISTANCE TO CORROSION, dimensional integrity, rigidity, and low manufacturing costs are the basic requirements for the top cover for a street light.

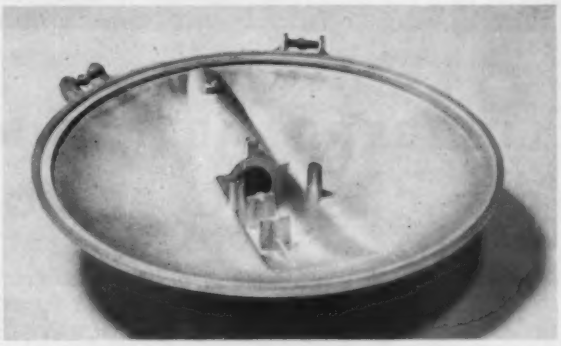
Corrosion resistance combined with low cost dictated aluminum. Rigidity required a casting, and dimensional integrity specified one of the precision casting methods.

The design of the cover called for a part about 15" in diameter, but to hold the weight down the wall thickness had to be as thin as possible. Further, the design would not permit the use of ribbing to get the stiffness with very thin walls.

Choice of a manufacturing method was reduced, therefore, to either die or permanent mold casting.

The problem of manufacture was taken to Monarch Aluminum Mfg. Co. With both die casting and permanent mold casting facilities, this company was able to make an unbiased choice and recommended permanent mold. The tooling costs were much lower for this process and, because quantities per order were small, set-up and down time were far less than for die casting.

At the very start of mold design the hinge lugs were recognized as potential trouble spots. If cast as unsupported lugs it would be difficult to hold the parallelism required. Another trouble was anticipated in ejection from the mold; the hinge lugs would tend to distort. The solution was the addition of a web between the lugs to hold dimensional accuracy and this web could carry a knockout boss to aid in ejection.

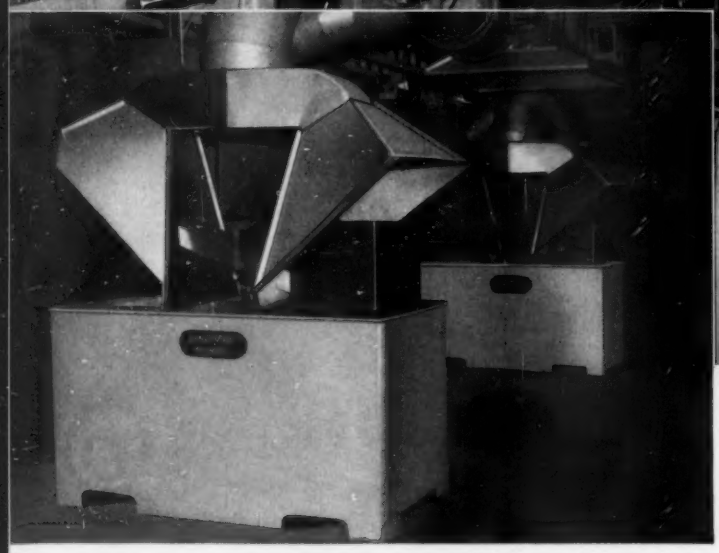


Two other critical areas were the long cored hole and the fixture mounting bosses.

The cored hole serves as a wire passage and had to be extra smooth, particularly as to removal of all flash to prevent cutting insulation.

The fixture mounting bosses are obvious critical points and both center-to-center distances and height had to be held closely.

Both of these critical areas are easily controlled by permanent mold casting.



Lindberg Melting and Holding Furnaces at Electrolux Corporation, Old Greenwich, Conn., are conveniently spotted adjacent to die casting machines. Special furnace hoods remove accumulated gases.

Lindberg battery at Electrolux. These 80 KW two-chamber induction furnaces melt and hold aluminum for die casting Electrolux Vacuum Cleaner parts. Note convenient chute to return gates and risers to melting chamber with splash shield.

LINDBERG MELT AND HOLD FURNACES HELP DIE CASTING EFFICIENCY AT ELECTROLUX

Recently, Electrolux Corporation, Old Greenwich, Conn., decided to die cast parts for the famous Electrolux Vacuum Cleaner in their own plant. To insure greatest efficiency and to provide the most ideal layout and working conditions Lindberg Two-Chamber Induction Melting and Holding Furnaces were selected to supply aluminum for the die casting machines. Electrolux has found Lindberg equipment to be completely reliable, ideal casting temperatures are easily maintained and the absence of noise and burner heat assures comfortable clean working areas. Operation has proved so satisfactory that two additional Lindberg furnaces have been purchased and are now being installed.

Wherever or however aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, remelting or heat treating are available in all capacities, electric or fuel fired. See your Lindberg Field Representative (consult your classified phone directory) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., Downey, Calif. In Canada: Birlefco-Lindberg, Ltd., Toronto. *Also factories in:* Argentina, Australia, England, France, Germany, Italy, Japan, Scotland, South Africa, Spain and Switzerland.

LINDBERG

Application of heat to Aluminum is a Lindberg Specialty

Heat and aluminum have been Lindberg's babies for many years. If your product requires the application of heat to aluminum anywhere along the line, we can help you do the job. From alloyed ingot and molten metal delivery from the reduction cells to the finished product Lindberg-Fisher furnaces meet *any* need for the application of heat to aluminum.

With Lindberg-Fisher furnaces, too, you get the expert technical skills of Lindberg Engineering Company's staff of engineers, metallurgists, technicians, widely experienced in all phases of aluminum melting, casting and treating. These are the people that engineered what we believe to be the largest installation of its kind, recently completed for one of the country's leading automotive manufacturers . . . over 75 furnaces including huge reverbs for storing molten aluminum, and smaller melting and holding furnaces for casting stations.

Over the years they have been responsible for many of the most important developments in the application of heat to aluminum. For instance, the technique of putting a cast lining in Induction Melting Furnaces to provide big savings in initial cost and maintenance. Also the Lindberg Autoladle, the first practical automatic aluminum ladling unit ever made to make possible fast, dependable, and economical casting of aluminum.

Because Lindberg builds all kinds of melting equipment, gas—oil—electric (resistance, 60 cycle induction, arc or high frequency) . . . we can intelligently and objectively recommend the proper type of equipment for your particular conditions and needs. Get in touch with your local Lindberg representative (see your classified phone directory) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg, Ltd., Toronto.

heat for industry

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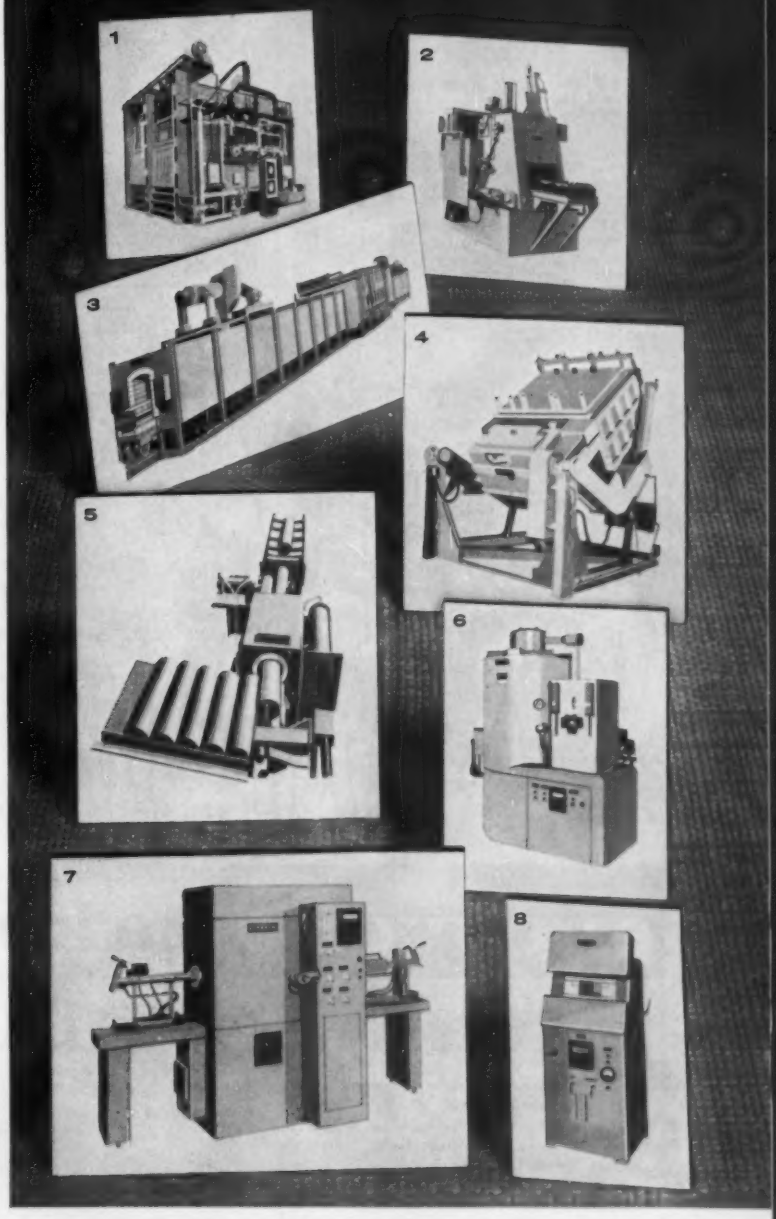

1 Melting and Holding Furnaces: Equipment for any non-ferrous metal requirement including electric resistance and two-chamber induction types, reverberatories, dry hearths and crucibles. Shown: Field-installed Reverberatory Furnace, 80,000 lb. capacity.

2 Heat Treating Furnaces: For every requirement, large or small, electric or fuel fired, factory built or field-installed. Shown: Automated Integral Quench Type Carbonitriding Furnace.

3 Ceramic Kilns: All types of kilns: automatic, atmosphere controlled, high temperature, tunnel and periodic. Shown: Tunnel Kiln with two automatic control zones for temperatures up to 3200° F.

4 Melting and Holding Furnaces: Equipment for any non-ferrous metal requirement including electric resistance and two-chamber induction types, reverberatories, dry hearths and crucibles. Shown: 350 KW Induction Furnace with 30,000 lb. capacity.

5 High Frequency Units: Complete range of induction heating units and furniture. Shown: New Induction Billet Heater for aluminum extrusions.

6 Atmosphere Generators: Generators for all required furnace atmospheres. Shown: Hyen Generator for endothermic atmospheres.

7 Pilot Plant Equipment: Complete group of intermediate sized furnaces for pilot plant and small production application. Shown: New Graphite Tube Furnace, temperature range 2500° F. to 5000° F.

8 Laboratory Furnaces: Complete line of laboratory furnaces from simple hot plates to specialized research units. Shown: Versatile, wide temperature range Laboratory Box Furnace.

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DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards

1. **Die Casting Machines** — 12-page catalog gives specifications on air and hydraulically operated die casting machines from 16 tons to 600 tons. ABC Die Casting Machine Company.
6. **Tool Steels** — Publication list from Allegheny Ludlum Steel Corp. describes 125 technical publications on tool steels which are available.
12. **Piston Ring** — Catalog from Auto-Diesel Piston Ring Co. lists plunger rings, tips and shot well sleeves for all die casting machine users.
14. **Sintering** — The "Engineering Handbook of Powder Metallurgy" is a technical booklet on engineering and manufacturing of sintered metals, bearings and parts. Bunting Brass & Bronze Co.
15. **Die Casting Machines** — Catalog gives complete specifications on a line of high-pressure cold-chamber and hot-chamber machines. B & T Machinery Co.
16. **High Temperature Alloy** — Technical Bulletin No. 86 from Cannon-Muskegon Corp. gives data on Rene 41, an alloy for use in the 1200°-1800°F. range.
20. **Investment Casting** — Brochure gives facts on the Glascast process and materials for high accuracy casting in precision shell molds. Corning Glass Works.
23. **Standardized Die Components** — which reduce design time and cut die construction costs, are described in a 170-page catalog. The Detroit Mold Eengineering Corp.
25. **Die Castings** — A 16-page facilities folder from the Dollin Corp. gives their die-casting techniques for solving rigid design requirements in zinc and aluminum castings.
26. **Metal Powder** — Literature from the Glidden Co. describes their Resistox Metal Powders that are prepared by a special process which removes all soluble salts.
28. **Iron Powder** — Technical literature on Hoeganaes Ancor 80 powder and how it will solve your particular production problem. The Hoeganaes Sponge Iron Corp.
30. **Die Casting Machines** — Bulletin CM-100 gives specifications on 100-2000 ton capacity cold and hot chamber machines. Cast-Master, H-P-M Div., Koehring Co.
31. **Zinc Die Casting Facts** — Henning Bros. & Smith, Inc. has issued an engineering data book on "Die Casting With Zinc Base Alloys."
33. **Investment** — Duracast, a non-ferrous investment, is just one of the industrial products described in Kerr Manufacturing Company's catalog.
34. **Die Casting Machines** — Catalog gives complete specifications on the full line of Kux Machine Co. die casting machines.
37. **Investment Castings** — The bi-monthly magazine, "Casting About With Misco," is available from Misco Precision Casting Co.
39. **Trim Presses** — Literature gives specifications and advantages on open gap or column type hydraulic trimming presses. Hannifin Co.
40. **Cleans, Lubricates** — That's what the Air-Lube System, manufactured by Pierce-Waller Inc. does. Technical data sheets available.
41. **Sintering Savings** — A technical report, "How to Cut Costs With The Remet Powdered Metals Process" is available from Reese Metal Products Corp.
43. **Ladles & Skimmers** — Technical data and prices are available from Spincraft, Inc. on their stainless steel ladles and skimmers.
45. **Statistical Quality Control** — for die castings. Technical literature from Stroh Die Casting Co., Inc. describes their use of quality control for lower inspection costs.
46. **Brass Die Castings** — Literature from Titan Metal Mfg. discusses the use of pressure brass Die Castings for your cored parts with thin sections.
47. **Steel Finishing Balls** — for producing mirror-like finishes with barrel finishing are described in Technical Bulletin AP-1. The Abbott Ball Co.
48. **Finishing Data File** — on process chemicals for the metal finishing industry. Allied Research Products, Inc.
49. **Painting Equipment** — Bulletin describes electro-formed masks, automatic painting machines, part and mask fixtures, and mask washers. Conforming Matrix Corp.
50. **Drilling Fixture** — Bulletin describes The Ettco Tool & Machine Company's fixture, which adapts to any drilling or tapping unit for multi-hole operation.
52. **Vibratory Finishing** — Booklet describes the Vibratron for precise finishing of castings. Roto-Finish Inc.
63. **Unit Die Blocks** — and ejector plates. Cavity blocks, said to give you practically 100% productive area, are described in a catalog sheet from Richards Tool & Mold Company.
64. **Tiny Zinc Die Castings** — Bulletin describes the "Intercast" method of making small die castings with moving elements in one operation. Gries Reproducer Corp.

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Vacuum Metallurgy
Determining Quality Of Cast Parts
Designing For Investment Castings
How To Buy Investment Castings
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Inspection Techniques
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another unique GRC die cast zinc alloy component

this movable Intercast® element unit was

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GRC's unique patented INTERCAST method die casts multiple-part zinc-alloy units with moving elements in a single, automatic, time-saving, money-saving elements . . . even continuously interlocked assemblies. Units leave the machine complete, ready for immediate use.

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66. **Alloys** — Technical report on 17-4PH and WI-52 high strength alloys. WaiMet Alloys Co.

69. **Sinterings** — Engineering Bulletin 3020 from American Sinteel Corp. gives technical data on ferrous and non-ferrous powdered metal products and their design.

70. **Induction Heating Units** — for brazing, melting, annealing, etc., are described in an engineering catalog from Lepel High Frequency Laboratories.

72. **Iron Powder** — Technical literature includes fatigue test data on Republic HSC 460 High Strength Powder. Republic Steel Corp.

73. **Die Casting Machines** — Specifications on the complete line of Lester die casting machines for aluminum or zinc. Lester-Phoenix, Inc.

74. **Investment Casting** — Bulletin describes latest investment casting methods for super alloys. Hitchiner Mfg. Co.

76. **Sinterings** — Powdered metal parts problems? A technical bulletin from Merriman Bros., Inc. shows how Merriman "know-how" solves powdered metal problems and cuts your costs.

77. **Cold Paint Stripper** — Technical data on Stripper S-26, which economically removes epoxy and other synthetic enamels at room temperature. Enthone Inc.

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2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
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13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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Whether it's design . . . engineering . . . die making . . . production . . . or inspection, Hoover has an exceptionally qualified team of experts. And they're backed by 36 years of experience in turning out the highest quality zinc and aluminum die castings. No wonder more and more companies are depending on Hoover to get the whole job done—and done right. How about you? If you need the full treatment—or any part of it—better call a Hoover Man.

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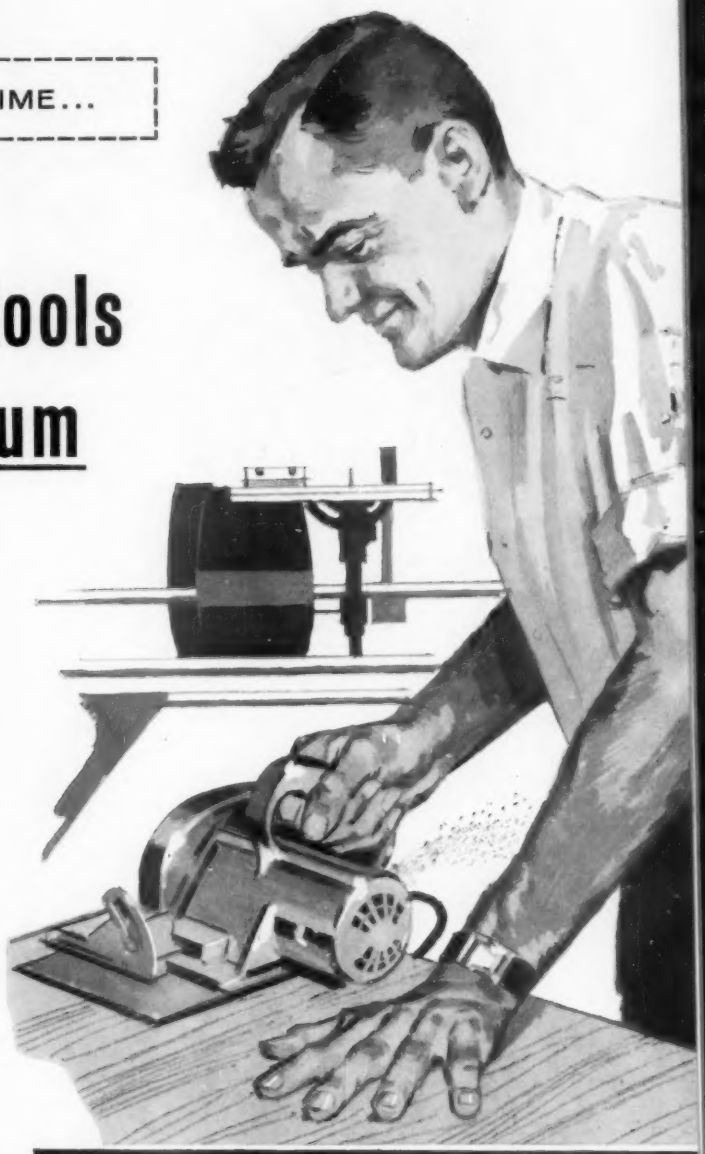
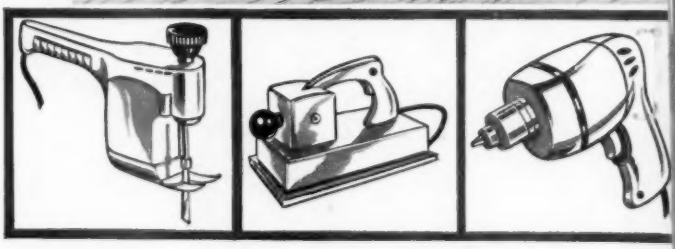


Today's homeowner is handier than ever and the professional works faster, delivers a better job—thanks to power tools and the versatility of aluminum. Whether you're sawing, sanding or drilling, these specialized tools provide the modern, easy way to finish the task.

Lightweight aluminum helps make power tools more portable, easier to handle. They give better service and last longer because aluminum is stronger. It's the one metal that resists rust, corrosion, pitting and chipping, always stays new looking. Too, manufacturers prefer aluminum because it can be formed in many ways, is easy to machine, and saves costly production steps.

Apex Smelting Company and its metallurgists work closely with the foundries and die casters who serve the power tool industry. Custom and standard aluminum alloys, scientifically produced by Apex to rigid specifications, are providing the performance and quality you want in these modern day work-savers.



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